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Original Communications

THERAPEUTIC ABORTION IN PULMONARY TUBERCULOSIS*

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THE patient with pulmonary tuberculosis is often referred to the obstetrician for the purpose of interrupting pregnancy. Too frequently the gynecologist or obstetrician lacks the special diagnostic skill required to arrive at the proper interpretation of chest diseases. If he is to be called upon to perform this operation, for which there is a very natural feeling of repulsion, he should acquaint himself with the experience and judgment of others. Unfortunately, in the literature, of which there is a great abundance, there is a wide diversity of opinion. Certain individuals believe unconditionally that the uterus should be emptied; others, as of the French school, or because of religious belief, while they admit the unfavorable effect of pregnancy upon the pulmonary lesion, will not consent to abortion; between these two extremes are those who take under advisement the facts of each individual case and come to a conclusion as a result of their findings.

Based largely upon the increase of weight which accompanies pregnancy, early writings suggest that gestation may have a favorable influence on pulmonary tuberculosis. From the enforced rest necessitated by pregnancy, there may be an actual improvement. Any improvement which takes place, however, is likely to be only temporary. After the fifth or sixth month, rapid advancement of the disease usually occurs. One cannot fail in reading to be impressed by the unfavorable influence of gestation on pulmonary tuberculosis. Practically all agree that when the disease is active, pregnancy is an exceedingly serious complication. Reference to a few statistics will suffice to show the feeling of those who have studied this question. Bridgman and Norwood compared a series of 72 actively tuberculous nonpreg-

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nant patients with 20 which were actively tuberculous and pregnant. Of the former 35 per cent were living and had improved at the end of a year, while only 10 per cent of the pregnant women were well and had improved. Thirty-three per cent of the nonpregnant women were unimproved, and 40 per cent of the pregnant. Thirty-two per cent of the nonpregnant had died, as against 50 per cent of the actively tuberculous and pregnant patients.

A contrary opinion is expressed by Forssner of Stockholm, who believes that pregnancy exerts little if any influence on the course of tuberculosis. He compared a group of 341 tuberculous women who had been delivered, with 396 tuberculous patients who had not been pregnant. At the end of two years the mortality was essentially identical in the two groups, being very low when the tuberculosis was mild, higher when moderately advanced, and very high in the most severe type.

The Germans, owing to registration laws, have exceptional opportunities to gather figures which are of value. In this country it is generally believed that tuberculosis complicated by pregnancy usually undergoes exacerbation, and that in the interests of the mother, abortion should be induced if the disease is detected in the first five months of gestation. When recognized later, intervention is not indicated, as induction of premature labor is followed by results as serious as delivery at term. Von Bardeleben found that when cases were severe or acute all exhibited an aggravation of the disease, especially toward the close of pregnancy. Forty-seven per cent died during pregnancy, labor, or the puerperium. Parry in a series of 38 cases, all of the severe type, showed that 50 per cent died within two months following labor, and so one could continue with almost universal agreement as regards the effect of pregnancy in the active type of pulmonary lesion.

As regards the effect of pregnancy upon inactive pulmonary tuberculosis, there is not the same unanimity of opinion. Bridgman and Norwood in 10 patients whose histories and signs pointed to the diagnosis of pulmonary tuberculosis in an inactive stage at the time of delivery: none had died; one had had "flare-ups" one year and two years later; another four years after delivery; seven of the 10 were in excellent health from six months to five years following delivery. Recrudescence was not more frequent in this series than in patients not pregnant. These observers state that while no tuberculous patient is pronounced cured, obviously the longer the duration of the inactivity, the less likely is the possibility of recurrence.

Schauta, on the other hand, found that 68 per cent of patients who had been well for a considerable period prior to pregnancy, suffered a relapse. Numerous other German statistics are to the same effect.

The present report offers no opportunity for a discussion of the

value of abortion in inactive or quiescent lesions. Of five cases of this type for which I have performed this operation, there is no follow-up in three; one, with a minimal lesion arrested for two years preceding pregnancy, is well; the remaining is a recent case with a minimal lesion, quiescent but three months when pregnancy occurred, with not sufficient interval to report results.

All realize that the vital factors in the treatment of active pulmonary tuberculosis are rest, proper food, fresh air, freedom from worry, and the ability to cooperate. One class of patient may possess these resources sufficiently—to her, pregnancy will not be the serious factor it might prove to be in the less fortunate individual.

In the selection of cases in which pregnancy is to be terminated, each patient should be studied individually: the history, her physical condition, her resistance, and what the home life will be. We will be unable to judge properly in all instances. Though they are the rare exception, certain women with advanced pulmonary tuberculosis will go through pregnancy, labor, and the puerperium and remain as well as they were before. Because one cannot foretell the result, some authorities believe that, to be on the safe side, the uterus should be emptied in every instance, a radical opinion which would result in much useless sacrifice of the infant.

It has been my opinion that any patient with an active pulmonary tuberculosis, or one in whom the disease has been but recently arrested, will run a great risk if she becomes pregnant, and the combination of pregnancy, labor, and the puerperium may prove a lethal factor. If the disease has been without symptoms for two years, especially of the fibrotic type, even though advanced, she may quite safely accept the adventure.

There are opinions expressed and statistics compiled which go to show that the operation of therapeutic abortion offers no better results as regards the mother, than when pregnancy is allowed to continue.

Bridgman and Norwood consider that the results of the operation in active pulmonary tuberculosis do not justify its procedure. They make these deductions from 9 cases, all the patients having been operated upon between the second and third months, with the exception of one at the sixth month. Two or 22 per cent were living and improved at the end of one year, two were living but not improved, and five or 57 per cent were dead within a year. Such figures, they state, suggest that the prognosis is made worse by operation, and the child is sacrificed. They admit the small series from which conclusions are drawn but believe their figures will be substantiated. They state further, however, that it is conceivable that evacuation of the uterus may be done in the early months of gestation under a spinal anesthesia without shock to the patient, or with a degree of shock which is not unfavorable in its results; but with the technic in vogue today, the operation is followed by a higher mortality rate than if expectant therapy alone is employed.

Forssner believes that intervention is never indicated, and that when it is resorted to, it is productive of more harm than good.

Most observers are not in accord with the views expressed above. Norris, Sergeant, Pankow, Bar, Kehrner, and many others advise the termination of pregnancy. This difference in opinions, and the statement by some that the operation is not justified, has led me to make a study of my own cases. I am presenting 38 instances of therapeutic abortion for which active pulmonary tuberculosis was the indication for operation. The complication of pregnancy and tuberculosis is encountered frequently in Colorado. These cases represent patients from the Colorado General Hospital, the Denver General Hospital, the Jewish Consumptive Relief Society, and private patients referred by reliable internists. The operations extend over a period of fifteen years. Of this number the "follow-up" is lacking in three cases, leaving 35 from which deductions are drawn. (Table I.)

There are seven deaths—20 per cent. An analysis of these shows that one with a minimal lesion died on the operating table from a nitrous oxide and ether anesthesia in the hands of an inexperienced anesthetist.

One died ten days following operation. Tuberculosis was far advanced with marked constitutional symptoms. The operation was a resection of the fundus, for combined interruption and sterilization, in a four months' pregnancy. A spontaneous pneumothorax developed and was the immediate cause of death.

The third death was two years subsequent to operation, a four months' pregnancy was complicated by a large ovarian cyst, the operation was hysterectomy and left salpingo-oophorectomy done under spinal anesthesia. The pulmonary lesion was advanced with marked symptoms. Improvement followed for six months, home conditions were poor, a laryngeal tuberculosis developed with progressive decline.

The fourth death resulted in a far advanced, very ill patient about six months pregnant. She had been spitting considerable blood. A bag was introduced and the products removed, using a small amount of nitrous oxide. A fatal hemorrhage occurred on the eighteenth postoperative day. This patient's pregnancy was complicated by a hydatidiform mole, about one-fourth of the placenta being involved.

The fifth I assume to be dead, she cannot be traced, a county patient with an advanced lesion and severe symptoms, three months pregnant, on whom an abdominal hysterectomy was done under a spinal anesthesia.

The sixth death occurred in a young woman, recently married. The lesion was moderately advanced, the symptoms severe. The uterus was emptied during the third month by dilatation and curettage under spinal anesthesia. A temporary improvement followed with then a rapid decline and death eleven and one-half months after operation.

Concerning the seventh death in a patient with a minimal lesion and slight symptoms, there is very little data. Her physician does not know how long after operation death occurred or anything of the circumstances. The operation was a curettage under chloroform at four and one-half weeks.

An analysis of these deaths shows that the first was unnecessary; of the remaining, four were in advanced cases, seriously ill, one in a moderately advanced case, seriously ill.

Most writers in presenting statistics on the subject of pulmonary tuberculosis and pregnancy, simply classify the cases as "active."

TABLE I. ACTIVE PULMONARY TUBERCULOSIS

	TYPE OF LESION	MONTH OF PREGNANCY	TYPE OF OPERATION	KIND OF ANESTHESIA	COMPLICATIONS AT TIME OF OPERATION	CONDITION AT PRESENT TIME	TIME SINCE OPERATION
1	Minimal lesion	6 wk.	D & C*	Ether	Small myoma	Unimproved	1½ yr.
2	Symptoms moderate	2 mo.	Bag with manual removal	Chloroform	None	Improved	Last heard from 3 yr. after operation
3	Symptoms moderate	8 wk.	Resection of fungus, sterilization	Spinal	None	Improved	2 yr.
4	Active record indefinite	7 wk.	D & C	Nitrous oxide	None	Unknown	10½ yr.
5	Minimal lesion	2 mo.	D & C	Spinal	None	Improved	4 yr.
6	Symptoms slight	4½ wk.	D & C	Chloroform	None	Dead	Time of death unknown
7	Symptoms slight	6 wk.	D & C	Spinal	None	Improved	1½ yr.
8	Symptoms slight Advanced lesion	4 mo.	Abdominal hysterectomy	Spinal	Large ovarian cyst	Dead	Lived 2 yr.
9	Symptoms severe Later laryngeal tuberculosis	3 mo.	Abdominal hysterectomy	Spinal	Patient very sick	Probably dead	Cannot be traced. Operation 3 yr. ago
10	Advanced lesion	4 mo.	Resection of fungus, sterilization	Spinal	Patient very sick	Dead	10 days developed pneumothorax
11	Symptoms severe	3 mo.	Abdominal hysterectomy	Spinal	None	Unimproved	2 yr.
12	Symptoms moderate	2 mo.	D & C	Chloroform	None	Unknown	15½ yr.
13	Symptoms moderate Minimal lesion	8 to 10 wk.	Resection of fungus, sterilization	Spinal	None	Improved	2½ yr.

*Dilatation and curettage.

TABLE I—CONT'D

	TYPE OF LESION	MONTH OF PREGNANCY	TYPE OF OPERATION	KIND OF ANESTHESIA	COMPLICATIONS AT TIME OF OPERATION	CONDITION AT PRESENT TIME	TIME SINCE OPERATION
14	Advanced lesion Symptoms severe, hem- optosis	6 mo.	Bag with manual removal	Nitrous oxide	1 of placenta hy- datidiform mole	Dead	18 days pulmonary hemorrhage
15	Advanced lesion Symptoms slight	8 wk.	D & C	Spinal	Artificial pneumo- thorax	Improved	2½ yr.
16	Minimal lesion Symptoms moderate	3 mo.	D & C	Ethylene	None	Improved	2 yr. 7 mo.
17	Advanced lesion Symptoms moderate	2½ mo.	Resection of fun- dus, sterilization	Spinal	None	Improved	7 mo.
18	Minimal lesion Symptoms moderate	6 wk.	D & C	Chloroform	None	Improved	3½ yr.
19	Advanced lesion Symptoms moderate	6 wk.	Resection of fun- dus, sterilization	Spinal	Artificial pneumo- thorax	Improved	1½ yr.
20	Advanced lesion Symptoms moderate	6 to 8 wk.	D & C	Spinal	Artificial pneumo- thorax vomiting	Improved	1½ yr.
21	Moderate lesion Symptoms severe	3 mo.	D & C	Spinal	Nausea weakness	Dead	11½ mo.
22	Minimal lesion Symptoms slight	3 mo.	Vaginal hysterot- omy	Nitrous oxide	None	Improved	Well 2 yr. Opera- tion 7 yr. ago. No follow-up
23	Advanced lesion Symptoms slight	6 to 8 wk.	D & C	Spinal	None	Improved	1 yr. 9 mo.
24	Minimal lesion Symptoms moderate, hemoptosis	6 wk.	D & C	Nitrous oxide	None	Improved. 1 child since	8 yr. 5 mo.
25	Active record incomplete	6 to 8 wk.	D & C	Spinal	None	Improved	2 yr. 8 mo.
26	Minimal lesion Symptoms moderate	6 to 8 wk.	D & C	Ether	Large kidney stone	Improved	13½ yr.

TABLE I—CONT'D

	TYPE OF LESION	MONTH OF PREGNANCY	TYPE OF OPERATION	KIND OF ANESTHESIA	COMPLICATIONS AT TIME OF OPERATION	CONDITION AT PRESENT TIME	TIME SINCE OPERATION
27	Advanced lesion	7 to 8 wk.	D & C	Spinal	None	Unimproved	1 yr. 1 mo.
28	Symptoms moderate	3½ to 4 mo.	Resection of fundus, sterilization	Spinal	None	Improved	2 yr.
29	Moderate lesion	2 mo.	D & C	Ether	None	Unknown	7 yr.
30	Symptoms moderate	3 mo.	D & C	Spinal	Retained portion passed 1 wk. after operation	Unimproved	Operation 2½ yr. ago. Improved up to phrenicotomy 1 yr. later
31	Advanced lesion	3 mo.	D & C	Ether	Laryngeal tuberculosis	Improved	Operation 14 yr. ago. Improved last report 3 yr. after operation
32	Moderate lesion	6 wk.	D & C	Nitrous oxide	None	Improved	5 yr. 3 mo.
33	Symptoms slight	3 mo.	Bag and manual removal	Chloroform	None	Improved. 1 child since	15½ yr. Advanced fibrous lesion
34	Advanced lesion	6 wk.	D & C	Nitrous oxide	None	Improved. 2 children since	5½ yr.
35	Minimal lesion	7 wk.	D & C	Spinal	None	Unimproved	2 yr. 10 mo.
36	Symptoms slight	3 mo.	Vaginal hysterotomy	Nitrous oxide	None	Unimproved	2 yr. 1 mo.
37	Advanced lesion	2 mo.	D & C	Nitrous oxide	None	Improved fibrous lesion. One child since	1 yr. 10 mo.
38	Symptoms moderate	3½ mo.	Abdominal hysterectomy	Nitrous oxide and ether	Anesthetic death	Dead	Death on operating table

The subsequent progress of the disease and the effect of interruption of pregnancy, depends very largely on the type of lesion and degree of symptoms at the time of interference. This is to me the most vital consideration. Table II is arranged to indicate results according to the amount of involvement and degree of symptoms. The classification of the National Tuberculosis Association has been followed.

Table II shows, as would be expected, that those presenting a minimal lesion do better: 72.7 per cent have improved, 9 per cent are unimproved. The two deaths, 18 per cent, are represented by the anesthetic death previously mentioned, and by the one of which nothing but the fact of death is known.

There are nine cases with a moderate lesion. The result in two is unknown. Four or 57.2 per cent are improved. Two or 28.56 per cent are unimproved. There is one death, 14.3 per cent.

TABLE II

LESION	SYMPTOMS	IMPROVED	UN-IMPROVED	DEAD	UN-KNOWN
Minimal 11 cases	Slight	4 = 36.3%	1 = 0.9%	2 = 18%	
	Moderate	4 = 36.3%			
	Severe				
	Total	72.7%	0.9%	18%	
Moderate 7 cases	Slight	2 = 28.6%	1 = 14.3%		2
	Moderate	2 = 28.6%	1 = 14.3%		
	Severe			1 = 14.3%	
	Total	57.2%	28.56%	14.3%	
Advanced 16 cases	Slight	2 = 12.5%			
	Moderate	7 = 43.7%	3 = 18.7%		
	Severe			4 = 25%	
	Total	56.3%	18.7%	25%	
Lesion active Type unknown	Degree of symptoms not definite	1			1

In the advanced cases, of which there are 16, 56.3 per cent have improved, 18.7 per cent are unimproved, and four or 25 per cent are dead. These deaths are in cases showing severe symptoms at the time of operation.

It is my contention, as I believe is shown in this series, that the seriously ill patient is rarely benefited by interruption of pregnancy. Death occurred in all four of such of my cases in the advanced group, and in the one moderately advanced, seriously ill. The gynecologist when presented with these patients finds himself placed in a very difficult position; the mother is doomed whatever the surgeon decides to do, yet the family and often the physician will urge interference. My belief is that when the individual is desperately ill, pregnancy should be allowed to continue, resorting to cesarean section at, or as near term as possible, in the hope that occasionally a child may be saved.

Table III is arranged to show the results from the type of operation performed.

There are 23 cases on which a curettement was done, about the simplest procedure possible. The results are unknown in three. Fourteen or 70 per cent are improved, four or 20 per cent unimproved, with two deaths, 10 per cent.

The use of the dilating bag with removal of the products of conception manually, also a simple procedure, is represented by only three cases; it shows the next best results, with two or 66.6 per cent improved and one dead, 33.3 per cent.

Vaginal hysterotomy, splitting the cervix with removal of the fetus and placenta, shows one case improved and one unimproved.

There are four cases of abdominal hysterectomy: one case unimproved, 25 per cent; and 3 dead, 75 per cent. These deaths are in far advanced lesions and the anesthetic death, and were in patients four

TABLE III. TYPE OF OPERATION

		IMPROVED	UN-IMPROVED	DEAD	UN-KNOWN
Simple procedure	Curettement	14 = 70%	4 = 20%	2 = 10%	3
	Bag with manual removal	2 = 66.6%		1 = 33.3%	
	Vaginal hysterotomy	1 = 50%	1 = 50%		
	Total	70.8%	20.8%	8.3%	
More radical	Abdominal hysterectomy		1 = 25%	3 = 75%	
	Resection of fundus with fetal sac. Combined sterilization	5 = 83.3%		1 = 16.6%	
	Total	50%	10%	40%	

months, three months, and three and one-half months respectively. There is no question that the larger operations with shock, loss of blood, and stormy convalescence are to be avoided when possible.

Regarding the cases in which resection of the fundus was done for the purpose of combining therapeutic abortion with sterilization, there are six cases: five improved, 83.3 per cent; and one death, 16.6 per cent. The death occurred in the patient previously described with a far advanced tuberculosis, seriously ill, who developed a spontaneous pneumothorax and was four months pregnant.

Regarding this operation, in certain instances sterilization of the tuberculous patient is indicated. Osler quotes Dubois to the effect that "If a woman threatened with tuberculosis marries, she may bear the first accouchement well, the second with difficulty, and the third never." It is obviously wrong to allow repeated pregnancies where there is recurring recrudescence of an old lesion. An operation which I have devised is done by laparotomy under spinal anesthesia. A wedge of the fundus, including the cornual ends of the tubes, the

products of conception, and the compact portion of the decidua, is removed without opening the sac. Stay sutures placed, including the uterine ends of the tubes and a part of the body of the uterus, largely check the bleeding, the small amount from the cut surface of the uterus is controlled by Allis forceps. The elliptical incision is then closed in three layers, and the raw surface covered by the round ligaments, which also serve to hold the uterus in good position. The operation is quickly performed, simple even in the more advanced cases of pregnancy, clean, and eminently satisfactory. Often a far advanced pregnancy is more easily and safely cared for by this operation than by attempting removal from below. It has this advantage over the usual hysterotomy and some combined operation on the tubes, in that the one incision in the uterus does for both these procedures. Ovarian function and menstruation are normal.

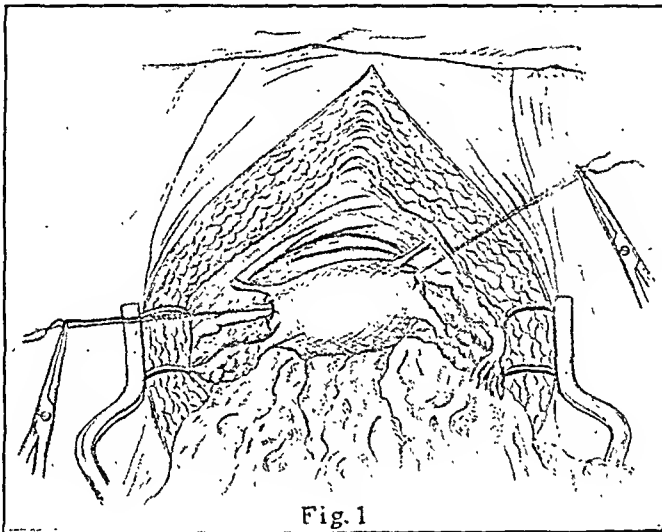


Fig. 1

Table IV refers to the period of gestation at the time of operation. The cases are arranged to include those operated upon before and including the third month, and those done at a later date. The earlier the pregnancy, the simpler the procedure. Interruption performed after the third month offers technical difficulties which may influence the future progress of the patient.

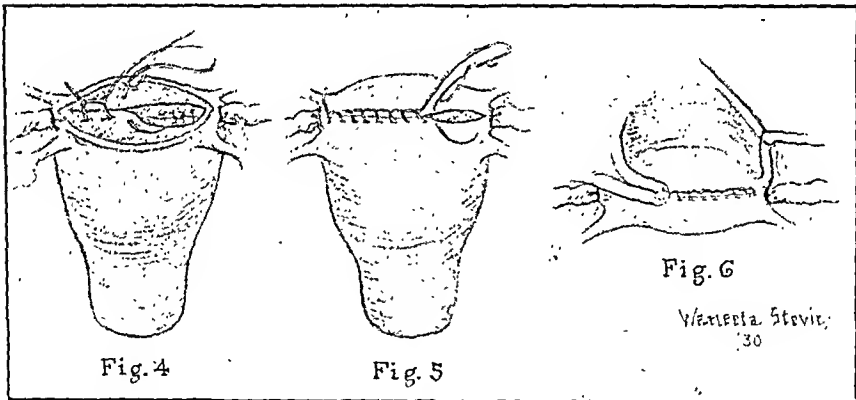
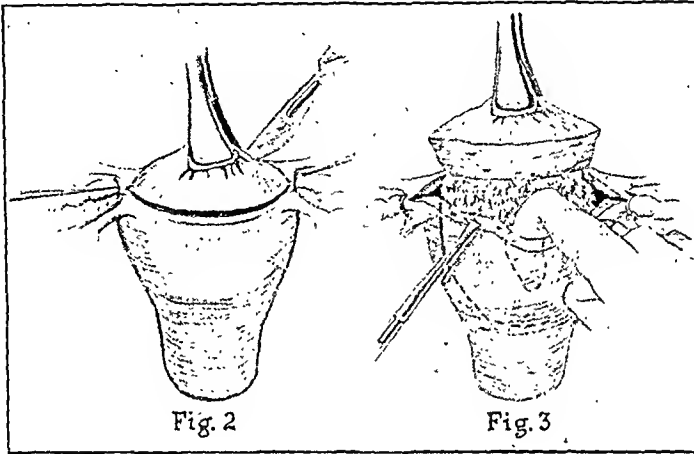
Twenty-one or 70 per cent operated upon during the first three months are improved. Six or 20 per cent are unimproved. Three or 10 per cent are dead. The results in three are unknown.

TABLE IV

	IMPROVED	UN- IMPROVED	DEAD	UNKNOWN
3 months or less	21 = 70%	6 = 20%	3 = 10%	3
More than 3 months	1 = 20%		4 = 80%	

There are five cases operated upon after the third month: one improved, 20 per cent; with four dead, 80 per cent. An analysis of the deaths in this latter group shows one due to the anesthetic; the other three are in advanced tuberculosis in seriously ill patients, one at six months, the two others at four months.

The condition of the patients at the time of operation has undoubtedly been a greater factor than the duration of pregnancy. One must,



however, consider the shock, possible loss of blood, and effect on the lesion from the operation in the more advanced cases of pregnancy. It may be preferable to allow a continuance to term, without sacrifice of the child, by delivery in the manner best indicated. Most observers believe that interruption at a later date than five months offers as serious difficulties as labor at term.

The final consideration concerns the kind of anesthesia. In nine nitrous oxide, five chloroform, four ether, and in one ethylene was used, in 19 spinal anesthesia was employed. While undoubtedly one type of inhalation anesthetic possesses qualities superior to another

as regards lung irritation, kidney damage, and postoperative sequelae, they will be grouped together for comparison with spinal anesthesia.

From Table V there seems to be little choice: 68.7 per cent improved, 12.5 per cent unimproved, and three dead, 18.7 per cent, with inhalation anesthetic, as against 57.9 per cent improved, four or 21 per cent unimproved, and four or 21 per cent dead with spinal. The inhalation figures are a little better. Concerning the deaths, one was definitely due to anesthetic. The three deaths in the spinal cases were all far advanced pulmonary cases, one moderately advanced, seriously ill.

In spite of the findings, my impression is that on operating upon women with pulmonary tuberculosis, spinal anesthesia is preferable. There is little or no lung congestion. Shock, nausea, vomiting, straining, and abdominal distention are lessened. In abdominal work relaxation is complete, and when the cervix is dilated it stretches more easily.

If we are to sacrifice the fetus for the welfare of the mother, let us stop to consider what the outlook for the child born from the tuber-

TABLE V. TYPE OF ANESTHETIC

	LESION	IMPROVED	UN- IMPROVED	DEAD	UNKNOWN
Inhalation	Active	11 or 68.7%	2 or 12.5%	3 = 18.7%	3
Spinal	Active	11 or 57.9%	4 or 21.0%	4 = 21.0%	0

culous mother would be. Congenital tuberculosis is practically a negligible consideration. Whitman and Greene have collected 38 cases with characteristic histologic findings, and 21 others in which bacilli could be demonstrated in the fetus and placenta, but without tissue lesions. As regards the susceptibility of the child to this disease, it is still an unsettled point. The child of the tuberculous mother, provided it is in intimate contact, has a poor chance of escaping infection. About 50 per cent (Parry) die within the first year, with a high rate of mortality in the next two to three years. When the child is taken away from the mother and put in suitable surroundings, it has an excellent chance. Armand Delille studied a series of 787 children born or living in 175 families, one or more members of which were tuberculous; of these 323 were placed in the country and did well, 396 were not removed, and of these 238 developed tuberculosis.

A certain percentage of deaths in children of tuberculous mothers is due to improper bottle feeding and inadequate care on account of the invalidism of the mother. Norris says that while we see large healthy babies from tuberculous mothers, it is probable that a large series of cases would show that they averaged smaller and weaker than from the healthy mother.

A summary of these 35 cases for which therapeutic abortion was done because of active pulmonary tuberculosis, shows 22 or 62.9 per cent improved, 6 or 17.42 per cent unimproved, and 7 or 20 per cent dead.

The fact that these figures are better than those of certain other observers might indicate that the operation was done in the presence of minimal or moderate lesions. In all the disease was active at the time of operation. Eleven showed a minimal lesion, seven moderately advanced, and 16 an advanced disease. In five the symptoms were severe at the time of operation, and all have died. In the far advanced, severe case the immediate and later mortality is so high as to render little value from the operation. The effect of pregnancy on the actively tuberculous patient is so universally bad, that if she is to be spared a life of invalidism and be given a chance for recovery, gestation should be interrupted when the opportunity for improvement is possible. The type of operation, the period of gestation, and the anesthetic to be used are other factors of importance.

If the expectancy of death is in the neighborhood of 50 per cent when pregnancy is allowed to continue in the presence of active tuberculosis, this review would indicate that the operation of therapeutic abortion is justified.

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THE THERAPEUTIC AND DIAGNOSTIC VALUE OF CURETTAGE IN SO-CALLED FUNCTIONAL UTERINE BLEEDING

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IT IS almost axiomatic, that a woman with abnormal uterine bleeding at some time or other in the course of the disease, is subjected to a curettage. What is the purpose of this procedure, and what value has it? Too often it is done because the patient seems to expect it, or because the physician has ingrained in his gynecologic training the association of curettage with uterine bleeding. That it is important and often necessary is unquestioned. Its value as a diagnostic measure is a well-established fact. The necessity for its use in all cases before the introduction of radium, or the utilization of x-ray therapy is too well accepted to admit of discussion, but does it in addition hold out a hope of cure, and if so, in what type of case? The two points we wish to emphasize are, its curative value, if any; and its importance as a procedure to obtain material as a basis for prognosis in functional uterine hemorrhage.

Novak and Martzloff¹ state that a small group of bleeding cases was cured by means of curettage. Novak, in his monograph² mentions the fact that cases of uterine hyperplasia and associated bleeding were not usually cured by curettage. Hintze,³ in a review of uterine bleeding and curettage had 24 cases of a benign type, 20 of a serious type and 4 atypical cases. The histologic pictures of the curettings obtained from these cases gave no indication of their clinical variation. In his follow-up, which lasted from four months to three years, he had 6 cures in the mild cases following the first curettage; and 6 cures following the second curettage from one and a half to two years after the primary one. The histologic pictures of the mucosa obtained at the second curettage were the same as the first. In the severe cases hysterectomy or radiation alone gave good results.

Fuss,⁴ in the study of the effect of curettage on bleeding, divided his cases into mild, medium, and severe hyperplasia. In 17 cases of the mild type, 13 patients were cured. In 14 cases of the moderate grade, 2 patients were cured, and of the 19 cases of the severe grade, none were cured. By cure, he meant a cessation of the bleeding, or a return to normal. He likewise had a group of cases in which he found atrophic mucosa. These were elderly women, and 5 of the 6 cases were cured by curettage, there being no periods after the operative intervention. There were 15 cases of endometritis with 13 cures, and he concludes that inflammations and polyps, or the bleeding associated with atrophy in old women can be helped, while that associated with hyperplasia is not cured by curettage.

Schickele and Keller⁵ in 111 patients curetted for uterine bleeding had 38 successful and 61 unsuccessful cases. Of the 38 successful cases only 4, or 10 per cent were associated with hyperplasia; and of the 61 unsuccessful cases 9, or 15 per cent were associated with hyperplasia.

Shaw⁶ published a classification of bleeding cases. In 53 patients between the ages of forty and fifty, the endometrium showed superficial areas of necrosis with no premenstrual change. They gave a history of bleeding usually from eight to ten weeks. In 50 per cent of the cases there was a period of antecedent amenorrhea. Thirteen per cent of these cases were permanently cured by curettage.

Novak and Martzloff⁷ advise curettage in hyperplasia associated with bleeding, as at times a cure results. Most often, however, bleeding recurs in a few weeks or months. It may be preferable, in young women, to repeat the curettage several times.

Graves, Anspach, Eden and Lockyer all mention the use of the curette as a means of alleviating the bleeding associated with hyperplasia, but none of them believe it is curative.

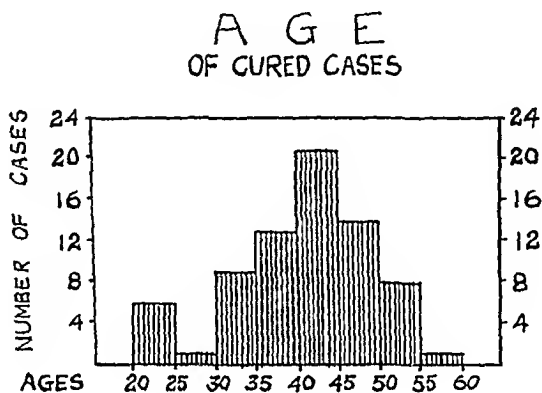


Chart 1-A.

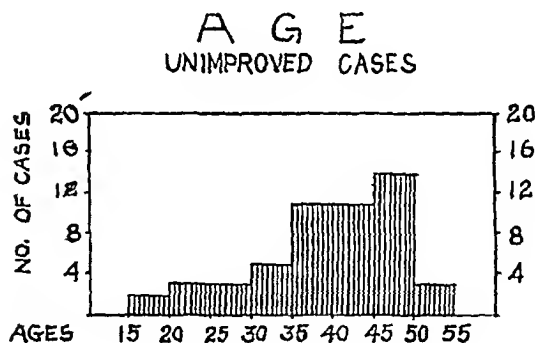


Chart 1-B.

We can see from the expressed opinions, that while curetting is advocated as the only nonradical operative therapeutic measure, nevertheless, its value as a means of permanent cure is apparently not very great.

Our study included 142 cases. We attempted to determine if curettage alone was a curative measure and to what extent it could be relied upon. Furthermore, we endeavored to define a pattern from the histologic study of the mucosal shreds which would permit us to prognosticate in what type of cases we might expect a satisfactory, permanent result from curetting, and in what type other procedures were advisable. Seventy-three cases were classified as cured by curet-

ting, 69 as improved or unimproved. The follow-up in these cases was over a period of six months to two years. It is, of course, inconclusive in so far as the period of observation was limited.

In Chart 1 A, which illustrates the variation in age of those cases which were cured, it will be noted that the greatest number of cures was obtained between the ages of forty and forty-five. On the other hand, the comparison with Chart 1 B, representing the uncured cases, the proportion of failures was greatest between the ages of forty-five and fifty. On the whole, there is too little difference in the two groups to enable us to utilize the age of the patient as of prognostic importance.

CHART 2

	MARRIED	WIDOW OR DIVORCED	SINGLE	TOTAL
Cured	68	3	2	73
Unimproved	41	4	7	52
Improved	12	5		17
Total	121	12	9	142

In Chart 2, representing the marital status, it can be seen that no definite decision can be made from the marital status that would be of prognostic significance.

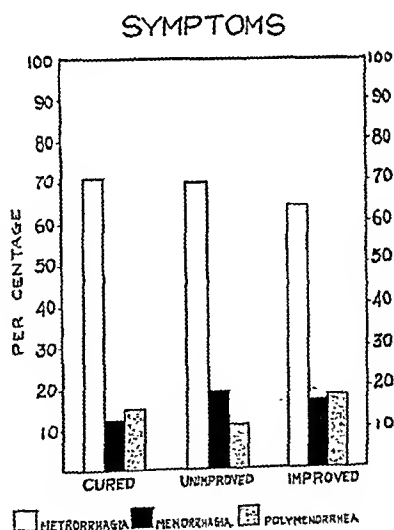


Chart 3.

Chart 3, which illustrates the variation in symptoms, shows that the proportion of cured cases was strikingly similar to those that were unimproved, or slightly improved, irrespective of whether the complaint was metrorrhagia, menorrhagia, or polymenorrhea.

In Chart 4 it was noted that the proportion of cured cases was greatest in the menorrhagias of comparatively recent date, that is, a history of from three to five weeks. On the other hand, the proportion of un-

cured cases, see Chart 5, was strikingly similar, being most marked in the metrorrhagias of from two to three weeks to two to three months. The result of this similarity leaves any deduction from the duration of the symptoms indecisive.

The histologic study of the curetted material gave us a little more satisfactory data on which to base a prognosis. As will be seen from Chart 6, in those cases where the glands were not increased in numbers, cures were more frequently obtained. (Fig. 1.) In those cases

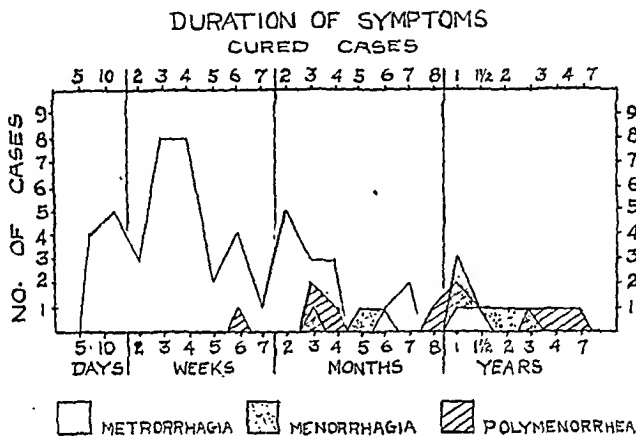


Chart 4.

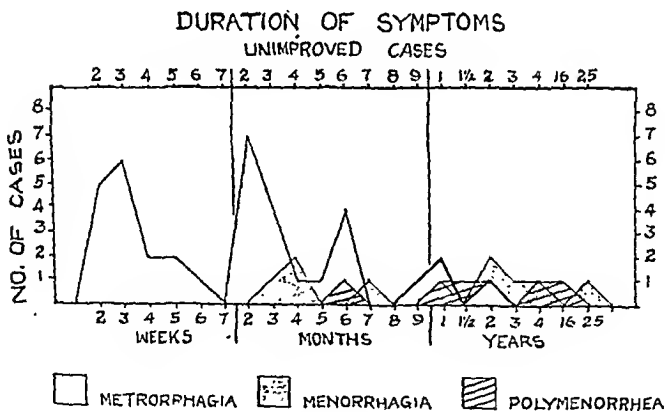


Chart 5.

in which the disturbance of the glands was irregular, and by that is meant an increased number of glands, cystic or otherwise, in both superficial and basal layers with no definite arrangement, the cures were definitely less frequent (Fig. 2) than where the disturbance of the increased or dilated glands was limited to the basal layer. In addition, those cases which presented, as seen in Chart 7, cystic glands in large numbers, were the least amenable to treatment by curetting. (Figs. 3 and 3-A.) The character of the stroma, which was also studied, and the result of which is graphically presented in Chart 8.

did not seem to enable us to prognosticate the therapeutic result from curettage. Those cases showing either cellular or edematous stroma occurred in greatest numbers and showed, approximately, an equal

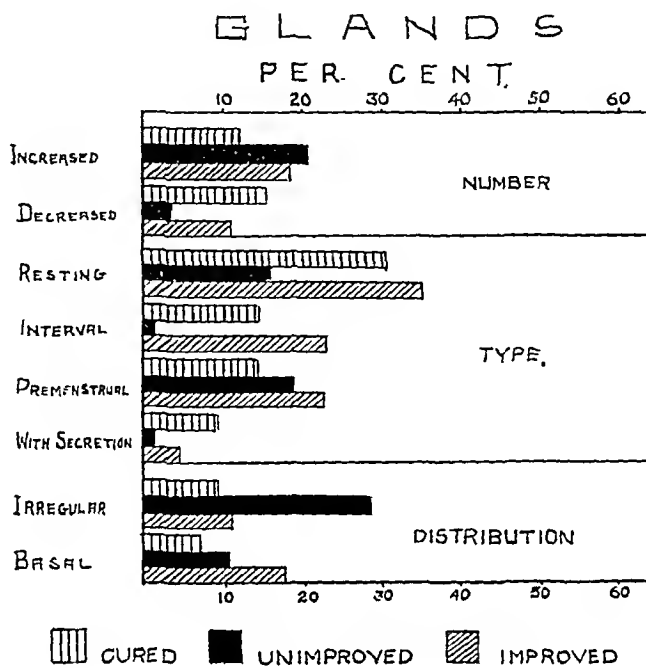


Chart 6.

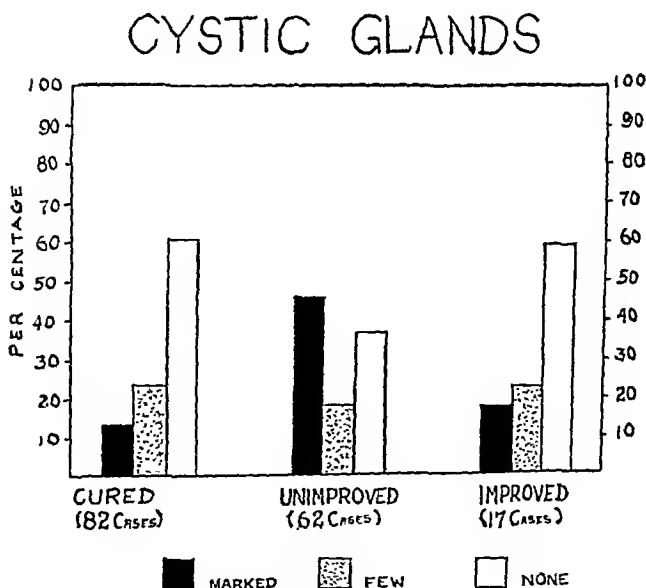


Chart 7.

number of cases cured, improved, and unimproved. The surface of the mucosa was also studied, as represented in Chart 9, and it will be noted that in those instances where the surface was reported as

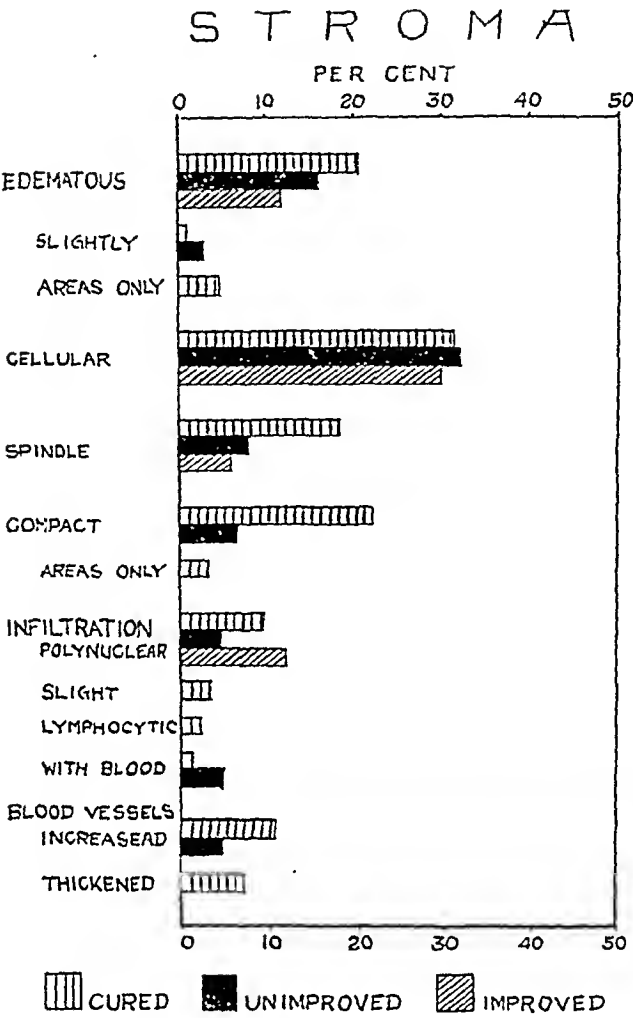


Chart 8.

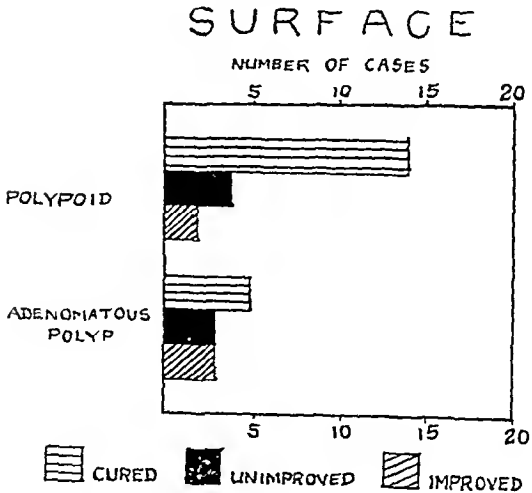


Chart 9.

polypoid, the proportion of cures was greatest. (Fig. 4.) Of course, it was also found that the polypoid surface was more commonly associated with a mucosa that did not present a tremendous increase in glands, or irregularity in distribution. Of the 9 patients cured with



Fig. 1.—Mucosa from case with typical history, showing rather cellular stroma with no great increase in number or size of glands. Patient cured for one and a half years after curettage.



Fig. 2.—Mucosa from a case with typical history, showing increase in number of glands with irregularity of distribution and arrangement. Recurrence of symptoms in two months.

cystic glands, moderate or marked in amount, 6 were near the menopause, 1 was subsequently operated upon for fibroids, 1 showed a small adenoma in the mucosa, and 1 was cured only after four curettings. Of 23 cases that were cured, the mucosa showing a few cystic glands,

5 resembled histologically, and according to their history subinvolution following a pregnancy. Three showed inflammation of the endometrium with typical inflammatory exudate. (Fig. 5.) Two were near the menopause, 3 were associated with polypoid mucosa, 2 had definite adenomatous uterine polyps, and 6 presented no unusual find-



Fig. 3.—Mucosa from a case with typical history. Irregular dilated glands with increase in number. Recurrence of symptoms in two months.

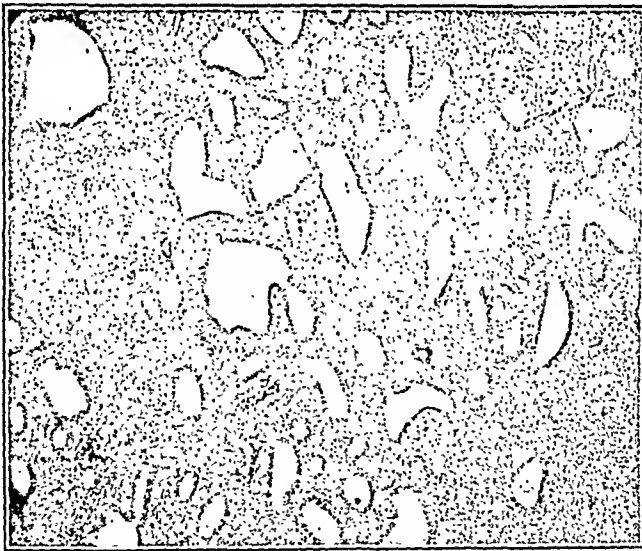


Fig. 3-A.—Mucosa from a case with typical history. Irregular dilated glands with increase in number. Other portions of mucosa showed resting glands (Fig. 8). Recurrence of symptoms in few weeks.

ings. Of the 41 patients cured with normal or atrophic (Fig. 6) mucosa, 9 showed subinvolution, 3 adenomatous polyps, 5 chronic inflammation of the endometrium, 2 had fibroids, 7 were at the menopause, 4 showed evidence of early pregnancy, and 11 presented nothing unusual in the curettings. The cured cases with cystic glands, as can be seen from the above tabulation, were few in number compared with

those with normal or atrophic mucosa. Apparently the etiology of bleeding in this latter type is different from that associated with true cystic hyperplasia. In some cases the histologic picture in the mucosa varied, some areas showing normal resting glands (Fig. 7) other places, dilated, irregular ones (Fig. 3-A) (both pictures from same case).

The total number of unimproved cases was 52. The comparison with the cured cases can be readily followed by having recourse to the charts above quoted. The follow-up period was terminated in these cases after six months by x-ray, radium, or operative treatment, except in cases of puberty bleeding. Of the 52 cases, in 9 the mucosa presented but few cystic glands, 5 of them located in the basal layer only.



Fig. 4.

Fig. 4.—Mucosa from a case with typical history. Showing polypoid surface. No recurrence of symptoms two years after curettage.

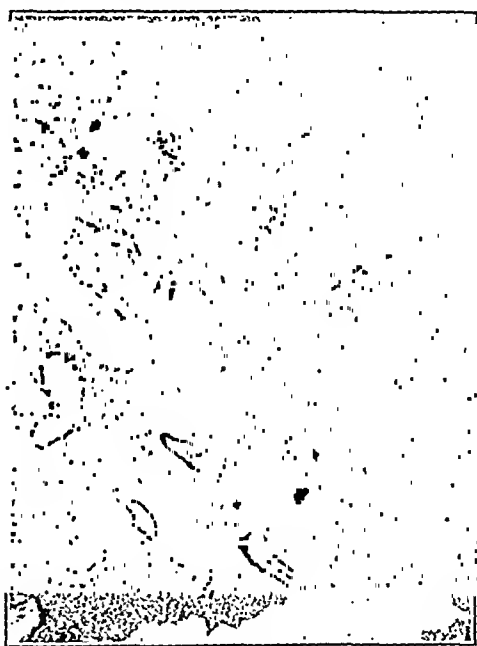


Fig. 5.

Fig. 5.—Mucosa from case bleeding irregularly for four months with exacerbation, showing purulent exudate and necrosis of mucosa. No recurrence nine months after curettage.

Two of these cases were associated with fibroids and 2 were puberty bleeding. These latter being treated conservatively. Nineteen showed cystic glands, 7 presented nothing unusual, and 3 were associated with fibroids. Two were probably subinvolution cases following incomplete abortions, 2 were cases with polyps, 1 was hydrosalpinx, 1 was inflammatory and 1 showed a few cystic glands in the basal layer. One on the first curetting showed a typical endometrium, the second curetting showed typical cystic glands. In one case the material was insufficient to be accurately diagnosed.

Distribution of gland content showed irregular distribution in 7 per cent of cured cases and 29 per cent of unimproved ones. In 3 per cent of cases where increased content was limited to basals, there were symptomatic cures, while 9 per cent of the cases with basal limitation were unimproved.

In the cases showing a few cystic glands in the mucosa, 24.4 per cent were cured. Sixteen and one-tenth per cent were not cured. In cases showing a marked increase in cystic glands, 14.6 per cent were cured, while 46.7 per cent were not cured. Sixty-one per cent of cases with no cystic glands were cured, while 37 per cent of cases with no cystic glands were unimproved.



Fig. 6.



Fig. 7.

Fig. 6.—Mucosa from a case with typical irregular bleeding. Showing atrophic mucosa. No recurrence of symptoms eleven months after curettage.

Fig. 7.—Resting glands in case with irregular cystic glands, see Fig. 3-A, showing variation in histologic picture in same case.

It is likely that many cases classified as functional bleeding are due to other causes, such as endometrial polyps, i.e. (a localized hyperplasia), inflammatory processes or subinvolution. This latter condition must be kept in mind, for it is surprising how often cases of true endocrine type give a history of preceding amenorrhea. Also, a number of cases were noted where, after a period of observation, a definite fibromyoma developed, which, at the original examination was not present, or could not be determined.

It is also likely that the so-called functional bleeding may be due to a variety of causes which give rise to entirely different histologic lesions in the mucosa.

CONCLUSIONS

It is evident that neither from the type of bleeding, the duration of the symptoms nor the histologic data, can a definite prognosis be made as to the possibility of cure. It would seem, however, that in those cases with marked increase in gland content of cystic type with irregular distribution, the possibility of cure by means of curettage is unlikely.

Curettage then may be of curative value in inflammatory cases, those with polyps or polypoid endometrium with scanty or normal gland content, or in those cases where a subinvolution subsequent to a previously overlooked gravidity, presents the clinical picture of a functional metrorrhagia. All cases (except the puberty cases) should be curetted and observed, as a first procedure, and if necessary, with a recurrence of symptoms, recuretted before more drastic steps are taken.

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100 EAST SEVENTY-FOURTH STREET.

THE MODERN CONCEPTION AND TREATMENT OF UTERINE BLEEDING*

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EVERY woman ought to know, every physician does know, that excessive bleeding at the time of the regular menstrual period, intermenstrual bleeding of any degree, and abnormalities of the menstrual flow at any age of life, are not physiologic. Uterine hemorrhage is one of the commonest of gynecologic affections, but because uterine bleeding at certain periodic times is normal, patients and physicians alike are inclined to minimize the possible consequences of a departure from the normal, with the result that many an unnecessary tragedy occurs. Even moderate bleeding can bring about a train of evil consequences, while a spotting almost too slight to be dignified by the term can be and frequently is the danger signal, the initial warning, of one of the most insidious and most fatal diseases in the whole catalogue of medicine.

*Read before the sectional meeting of the American College of Surgeons, Little Rock, Arkansas, January, 1930.

The older textbooks have little to say on this special subject, and most of what they have to say is wrong, because the whole conception of pelvic physiology has been reversed within the last quarter of a century. We know now that while the uterus is the point of origin of the menstrual flow, it cannot of itself initiate it. We know that the endometrium simply responds to the stimulation of the ovary, whose hormones cause in it first a proliferative and then a secretory activity. We know that behind the ovary lies another force, the anterior lobe of the pituitary gland, whose five hormones exert a profound influence not only upon the general organism but specifically upon the genital tract. We know that while menstruation is a normal function of the uterus, and excessive or irregular bleeding indicates a depraved function, it by no means follows that the perversion is uterine in origin. Indeed, we may safely say that except in those instances in which definite uterine pathology can be demonstrated, the hemorrhage is extrauterine in origin and the uterus is simply an unwitting accomplice to an evil that exists elsewhere.

Unless these facts are constantly borne in mind, our treatment of this very common gynecologic affection is likely to be sadly in error. We are likely to do considerable damage, even as our forefathers did, by unnecessary and meddling local treatment. We are likely to do even more damage, as some of us, I am sorry to say, are still doing, by unnecessary and radical surgical treatment. The chapter on the physiology of the female genital tract, particularly in its relation to the endocrine system, still lacks a conclusion, but enough of it has been written to make us question very seriously the wisdom of much that we have done in the past. Menstrual disturbances in older women rarely represent special problems, for, once malignancy is eliminated, entirely satisfactory methods of treatment can be promptly invoked. These methods are almost equally successful in young women, but unfortunately they cannot be so promptly or so generally applied, for the reason that the specific treatment for bleeding is too often a treatment which will permanently terminate functional life, a consideration which cannot and should not be ignored during the reproductive years.

The gynecologists of the last century worked in an era of physiologic darkness, as it were, but that did not prevent their mental processes from being exceedingly shrewd, and many of their general counsels are still applicable. One of Lawson Tait's I am particularly fond of quoting, to the effect that any practitioner seriously neglects his duty who undertakes the treatment of a patient in whom menorrhagia is a symptom without carefully informing her of the utter uselessness of any treatment until there is a clear perception of the conditions present. That warning might well be heeded today. It is plainly impossible to institute rational treatment without an accurate diag-

nosis, and since menorrhagia is only a symptom, not a disease in itself, it is plainly impossible to relieve it without knowing whence and why it arises.

Certain causes of hemorrhage need little elucidation. These include the hemorrhages of pregnancy, which are not essentially a gynecologic consideration; the metrorrhagic bleeding of old syphilitic lesions and of ulcerations from pessaries, which are intrauterine in origin, and of erosions and other obstetric injuries of the cervix; the bleeding due to retrodisplacements, which in my experience is not very frequent unless it is associated with varicosities of the broad ligament or with subinvolution; and the bleeding which is due to organic or infectious diseases, or simply to bad hygiene.

We might well linger on the subject of the bleeding due to uterine neoplasms, not so much polyps or fibroids, in which the diagnosis is clear, as the bleeding which is little more than a spotting and which is so frequently observed in women in or near the menopausal years. It is sometimes due to superficial lesions, it is sometimes due to senile atrophic changes, but in only too many cases it is due to malignancy somewhere in the genital tract, and the patient's very life depends upon promptness of diagnosis and treatment. No matter how trivial it may seem, it demands a searching investigation. Biopsy or diagnostic curettage followed by microscopic study of the tissues should be done routinely and without loss of time. There is a certain physician, I am told, who, when he is consulted by a woman with a lump in her breast, drives her immediately to the hospital in his own car. He may frighten some of his patients unnecessarily, but many of them, I am sure, owe their lives to him, and in the matter of uterine bleeding in women over forty, it might be well for gynecologists generally to follow his example. For early carcinoma is a microscopic, not a physical fact, biopsy, if done properly, is never harmful, and, most important of all, we shall never better our end-results in genital malignancy until we learn to give earnest heed to the slight initial signs which this most treacherous of all diseases exhibits.

We have learned in recent years that endometritis of infectious origin is a very rare affection, and that the hyperplastic changes in the endometrium, once considered pathologic, are most often simply the normal physiologic changes of the normal menstrual cycle. The studies of a host of investigators, among whom it would be invidious to single out individuals, have shown us the specific action of the ovary upon the endometrium, and recently of the pituitary gland upon the ovary, and so there is an increasing tendency and a very correct tendency to assign to ovarian dysfunction all uterine hemorrhages for which a clear local pathology cannot be demonstrated. The uterus is the channel of expression, it is true, but it is ovarian function which has primarily gone astray, and which is especially likely to go astray

at puberty, when the process of menstruation is initiated, and at the menopause, when it is terminated.

In spite of the very excellent clinical and experimental work which has been done along these lines, we are still decidedly in the dark as to how or why ovarian dysfunction occurs, and my own opinion, which I admit is the opinion of a mere clinician, is that we shall remain at least in the twilight until the men who are working in endocrinology and the men who are working in clinical gynecology correlate their endeavors far more than is the case at present. It would be ungracious, for instance, to pick flaws in the brilliant study of Wilfred Shaw, in which he classifies ovarian dysfunction according to the clinical symptoms taken in conjunction with the gross and microscopic ovarian and uterine findings, and yet I cannot refrain from reflecting that the work would have been infinitely more valuable had the endocrine factors been included also.

Moreover, the study of menstrual irregularities of endocrine origin must not end with the study of ovarian deficiency. In the light of our new knowledge we must go behind ovarian dysfunction and consider it in relation to the activity of the anterior lobe of the pituitary gland. More than one recent investigation has pointed out that relation and has intimated a possible pituitary dysfunction as the ultimate source of the ovarian perversion.

At least one pelvic abnormality is quite commonly found in association with uterine hemorrhage of ovarian origin. I refer to the uterine hyperplasia or hyperplastic endometritis which was first described by Cullen and has since been very thoroughly studied by Novak and Martzloff. All of these authors regard it almost as a specific clinical entity which is positively not of inflammatory or infectious origin, and which is characterized usually by gross proliferation of the endometrium and always by the so-called "Swiss cheese" pattern of the glands. If this hyperplastic overgrowth is removed by the curette, it frequently recurs in precisely the same form, which we may take as reasonable proof that the pathology is not local in origin. Since the normal proliferative activity of the menstrual cycle has been proved to be ovarian in origin, and since this overgrowth is simply an excess of this normal activity, it seems equally logical to consider it as a positive indication of ovarian dysfunction.

The treatment of uterine hemorrhage, it goes without saying, depends upon the pathology which gives rise to it. Superficial lesions, cervical erosions, uterine retroversions, constitutional diseases, these offer no special problems. Fibroids of the uterus, however, are a different matter. Small fibroids in young women can be managed by myomectomy, which is the operation of choice in properly selected cases in that it gives excellent immediate and end-results, and in that

it conserves function. Fibroids not of excessive size, provided certain conditions are met, can be managed even more efficaciously in older women, by a simple application of radium, which carries practically a zero mortality and which is successful in probably 90 to 95 per cent of all cases. But large fibroids, and especially fibroids with associated adnexal disease, do not permit, regardless of age, of either irradiation or myomectomy. Only hysterectomy is feasible. In the older woman, almost or entirely past her functional years, this is a matter of slight consequence except for the small operative risk, but in the young woman it is sometimes a tragedy. One has little choice in such a situation, and the best one can do is to be ruthless in the removal of the tumorous uterus and the diseased tubes, and to be as conservative as possible in the retention of the ovaries, so that the patient has at least the cold comfort of being spared the trials of a premature menopause.

Since nonpathologic uterine bleeding is indubitably of endocrine origin, it would seem that its treatment would be perfectly simple, the employment of endocrine therapy. But that, unfortunately, is rarely practical. In the first place, such therapy, which at the best is merely substitutional, is automatically hampered by the fact that most commercial extracts of the ovary contain none of its active principle; Frank found the entire group biologically inert, whether because there was so little of the active hormone in the ovarian tissue from which they were made, or whether what was present was destroyed in the process of manufacture, it is impossible to say. In the second place, absurdly large doses must be administered to achieve any effect at all, aside from the fact that it is generally believed that the active principle, if it should be present, is destroyed by the alimentary juices. Finally, it is very doubtful whether an ovarian hormone representing one stage of a sexual cycle can affect very markedly the internal economy of a woman who is possibly at another stage of hers. It seems to be the old story of the impossibility of duplicating in men the results obtained in mice.

Novak, commenting on the astonishing discoveries of the last few years in the field of endocrinology, says that it would be most unfortunate if the eager clinician should apply half-proved theories or speculative hypotheses to his special problems. I would amend that, to the effect that he most unfortunately has already done so and is continuing to do so. The literature abounds in reports of the brilliant results obtainable from ovarian therapy, reports which either do not impress one with their scientific accuracy, or else are based on pluri-glandular therapy in which thyroid extract is often the chief factor. Now it is well known that when the basal metabolic rate warrants it, the employment of thyroid extract often gives excellent results in menorrhagia, and such reports, therefore, are worthless from the

standpoint of ovarian therapy, for it is undoubtedly the thyroid extract which turns the trick. At any rate, it is most significant that the Council on Pharmacy and Therapy of the American Medical Association has recently, after an impartial review, decreed the omission of such ovarian preparations from its list of New and Non-Official Remedies. This may be the beginning of the return to sanity which Frank has been prophesying. For again it is significant that the men who have done the most careful work are the men who are most dubious about the clinical results of ovarian therapy as it must be practiced at present.

The future, however, promises well. Doisy and others have recently isolated the follicular hormone in crystalline form, each grain, it is said, possessing the potency of 2,000,000 rat units, and an active extract of corpus luteum has recently been prepared by Corner and Allen. When the various hormones of the anterior pituitary gland have likewise been isolated, and when all of these products have been made available commercially, and at a cost within reason, certainly a new day will dawn in the management of uterine hemorrhage of ovarian origin.

In the meantime we must use such weapons as we have. The first of these is the curette, and while I admit that it is a much abused instrument and is capable of infinite possibilities of harm, I also contend that it is a most valuable agent in the management of uterine hemorrhage, not only from the diagnostic standpoint, but as a tentative curative measure in young women in the functional years. I raise my voice and I am comforted, in looking over the literature, to note that it is not altogether a solitary voice, to contend that the curette should at least be given a chance, if not more than one chance, to fail before more radical measures are resorted to. I am willing to grant that curettage is an illogical procedure in that it does not reach the source of the trouble and in that the endometrium which is removed frequently grows back in precisely the same pathologic form, but the fact remains that it is sometimes curative, and that it is very often palliative. I have in my office the records of perhaps a dozen women whom I curetted at intervals over many years, and whose menorrhagia was held in check until they had reached the age when irradiation was no longer a radical measure. They shared with me the knowledge that this was the treatment of expediency, but they were willing, for the sake of preserving their functional life, to take the risk of failure, and surely in such instances the end justifies the means.

Quite as illogical, and yet sometimes just as successful, is the use of transfusion in young women. Why it should check uterine hemorrhage I cannot say, and I do not mean to give the impression that it checks it routinely, but it is effective in the occasional case, and it is certainly a measure well worth trying.

With irradiation we step immediately into the realm of radical treatment, not in the sense that life is threatened, but in the sense that function very decidedly is. There is still too little realization of the dangers of this method, a fact which W. J. Mayo expresses excellently when he speaks somewhere of the men who possess a nickel's worth of radium and do a million dollars' worth of damage with it. Radium must sometimes be used in young women, even in young girls, in whom every other measure has failed and for whom hysterectomy would be the alternative, but it must be used very cautiously, in very small doses, and with a full realization of what it may achieve from the standpoint of function. In older women the situation is different, and when the hemorrhage has been proved microscopically to be of benign origin and when there is no history of previous pelvic infection, radium is absolutely specific and the menopausal dose can be given without fear of consequences and with the assurance that success will follow a single application in all but a few cases. When one remembers that only a few years ago the sole treatment for menopausal bleeding was surgery, and radical surgery at that, one must be grateful indeed for this new arm of defense.

Finally there remains hysterectomy, and it is truly a last resort, not only because it destroys function irrevocably, but because, even when function is no longer of consequence, it carries an inevitable risk to life, a risk which should not be assumed, however minimal it may be, if any procedure without it is feasible. In many cases, however, there is no alternative, and for my own part, I would prefer surgery to a menopausal dose of radium in young women in whom every other measure, including submenopausal irradiation, has failed to effect a cure, for it does not destroy the ovaries, and so it is the lesser of two very great evils.

The limitation of time has meant that I could not present in detail the new conception of uterine bleeding and the consequent changes in treatment, but I hope I have at least made the point that menorrhagia is not necessarily of uterine origin, and that when it is not, the treatment should take that fact into account. We are still handicapped by incomplete knowledge, we are still handicapped by inadequate methods of therapy, but at least we are moving in the right direction, and if we keep our heads, the future promises well for the control of this very common, very annoying, and frequently very dangerous gynecologic affection.

THE PREVALENT HOUR OF STILLBIRTH

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(Director, Division of Vital Statistics New York State Department of Health)

ONE of the outstanding achievements in the field of public health has been the reduction in infant mortality. In the State of New York in 1915 (the earliest year for which the registration of births is sufficiently complete), the infant mortality was 99 per 1,000 live births; in 1929 it was 61. Thus, in the fifteen-year period the rate dropped 38 per cent. Again, in 1915, infant deaths represented 16.4 per cent of all deaths. In 1929 the proportion was practically half the earlier figure, 8.6 per cent. While it is true that the decline in the birth rate accounts for some of the decrease in the number of infant deaths, even when the necessary correction is made for this factor, the last percentage is raised only to 9.6.

The progress made in the saving of young lives has been due primarily to the reduced total of deaths among infants over one month old. The death rate among infants over one month and under one year declined from 57.7 in 1915 to 26.9 in 1929, 53 per cent. In the same period the death rate under one month declined but 19 per cent, from 41.5 to 33.7; among the several causes of death during the first month, the mortality from congenital malformations remained practically stationary, 5.6 and 5.7, while the rate from injuries at birth actually increased from 3.9 to 5.5.

The stillbirth rate (per 1,000 total births) was 41.4 in 1915 and 40.2 in 1929. The average rates for the successive quinquennia 1915-1919, 1920-1924, 1925-1929 were 40.7, 41.5, and 41.0. With the decline in infant mortality the practically stationary rate of stillbirths takes on an increasing importance. (See Fig. 1.) While sixteen years ago, for every 100 infants who died before reaching the first year of life, 44 were born dead, in 1929 the corresponding proportion was 69.

Let us summarize briefly the present state of knowledge regarding stillbirths:

In somewhat more than half of the cases described in the literature on this subject the deaths of the infants occurred before labor; the others, during the labor. A large proportion of stillbirths, roughly about one-third, are premature. We know but little about the causes inherent in the organism of the infant that are responsible for these deaths. Our knowledge of the causes relating to the condition of the mother is more extensive. Most frequent among them are syphilis, chronic inflammation of the kidneys, tuberculosis, general debility, alcoholism, and the febrile diseases, particularly influenza and pneu-

monia. As an illustration of the last statement, we may note that the highest monthly stillbirth rate in the State of New York (63 per 1,000 total births) was recorded in October, 1918, at the peak of the influenza epidemic.

The causes of stillbirths which occur during the process of birth are better known. The constitution of the mother, the position of the child, and various accidents at birth, are the important factors. The risk of a stillbirth, when mechanical assistance becomes necessary because of the mother's condition or the abnormal position of the infant, is almost nine times as great as in normal births. In the words of P. Strassman* "no other day contains so many dangers to the life of man as the day of birth, with which ends the contemplative life of peace within his mother's organism."

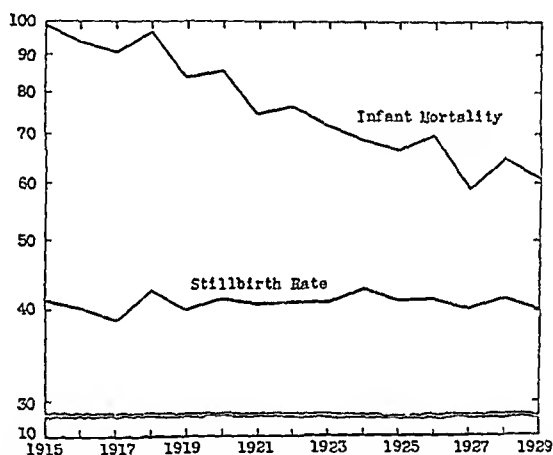


Fig. 1.—Stillbirth rate and infant mortality, New York State, 1915-1929.

Of the indirect causes of stillbirth the following have been noted: the sex, size and weight of the infant, the multiplicity of birth, the order of birth, the age and economic status of the mother.

The relative importance of most of these factors can be expressed quantitatively. Let us consider the experience of the Birth Registration Area for 1928, the latest year available and of the State of New York, exclusive of New York City (data for the City not being given in necessary detail), for the ten-year period 1920-1929.

The number of live births in the Registration Area in 1928 was 2,233,149; stillbirths, 89,765. The corresponding numbers for Upstate New York for the ten years 1920-1929 were 1,004,461 and 37,250.

The figures in Table I show that:

Stillbirths were relatively more numerous among males.

The stillbirth rate among illegitimate children was almost double the rate among legitimate children in Upstate New York, the disparity being even greater in the Birth Registration Area.

TABLE I. STILLBIRTH RATES PER 1,000 TOTAL BIRTHS (INCLUDING STILLBIRTHS)

	BIRTH REGISTRA- TION AREA 1928	NEW YORK STATE (EXCL. OF NEW YORK CITY) 1920-1929
<i>Sex:</i>		
Both sexes	39	36
Male	42	40
Female	34	32
<i>Legitimacy:</i>		
Legitimate	38*	35
Illegitimate	87*	64
<i>Multiplicity of Birth:</i>		
Single	38	35
Multiple	78	72
<i>Color:</i>		
White	34	35
Colored	75	61
<i>Nativity of White Mothers:</i>		
Native	33	34
Foreign	40	39
<i>Order of Birth:</i>		
First child	Not available	42
Second child		26
Third child		28
Fourth child		31
Fifth child		35
Sixth child		39
Seventh child		43
Eighth child		45
Ninth child		52
Tenth child		59
Eleventh child		65
Twelfth child and over		78
<i>Age of Mother:</i>		
Under 20 years	44	33
20-24 years	33	29
25-29 years	32	30
30-34 years	36	36
35-39 years	48	49
40-44 years	60	65
45 years and over	86	95

*Exclusive of California and Massachusetts.

The risk of a stillbirth among multiple births was more than double that among single births. It may be interesting to add some details for the Birth Registration Area not given in Table I. Twin births in 1928 numbered 26,794 or 53,588 individuals. In 1,756 births (6.6 per cent) one infant was born alive and one stillborn; in 1,175 births (4.4 per cent) both were stillborn. The stillbirths numbered, therefore, 4,106 individuals or 7.7 per cent of the total. Triple births numbered 305 (915 individuals). In 47 births (15.4 per cent) two of the infants were born alive and one stillborn; in 12 births (3.9 per cent) one infant was born alive and two stillborn; and in 20 triple births (6.6 per

cent) all of the infants were stillborn. The stillbirths numbered 131 individuals or 14.3 per cent of the total. There were also recorded three quadruple births, in one case all of the infants were born alive, in the other two all of the infants were stillborn.

The stillbirth rate for colored infants was considerably higher than for white infants.

The stillbirth rate was greater among infants whose mothers were foreign-born than among those whose mothers were native-born.

The risk of a stillbirth, with the single exception of primiparae, was directly related to the total number of children born to the mother. The stillbirth rate was least among mothers who were giving birth to a second child. The rate increased with each successive birth to an absolute maximum among mothers with twelve or more children. Among first-born, the rate was almost as high as among children who were seventh in order of birth.

Among infants whose mothers were in the youngest age group, under twenty years, the risk of a stillbirth was higher than in the next two age groups, the rate between the ages of 20 and 29 being the minimum. After the thirtieth year the rate mounted with age to a maximum in the group of oldest mothers, forty-five years and over.

An analysis of the live and stillbirths in the State of New York, exclusive of New York City, in 1929 suggests the possibility of still another factor, namely, the hour of birth. The distribution of these births according to hour is shown in Table II.

TABLE II

HOUR OF DELIVERY	LIVE BIRTHS	STILLBIRTHS	
		NUMBER	RATE PER 1,000 TOTAL BIRTHS
Total	93,230	3,398	35
Midnight - 2 A.M.	11,990	409	33
3 A.M. - 5 A.M.	13,289	415	30
6 A.M. - 8 A.M.	12,699	370	28
9 A.M. - 11 A.M.	13,001	442	33
Noon - 2 P.M.	9,604	366	37
3 P.M. - 5 P.M.	10,232	474	44
6 P.M. - 8 P.M.	9,910	418	40
9 P.M. - 11 P.M.	11,927	451	36
Hour not stated	578	53	—

The maximum number of live births (13,289) was recorded between the hours of three and six in the morning, exceeding by more than 38 per cent the minimum (9,604) between twelve and three in the afternoon. The distribution of stillbirths was, in general, opposite that of live births. Most of the stillbirths occurred during the day, the maximum (474) falling between the hours of three and six in the afternoon and the minimum (370) between six and nine in the morning. The stillbirth rate (see Fig. 2) was highest (44) between three and six in

the afternoon, greater by 57 per cent than the minimum (28) between six and nine in the morning. The next high rate (40) was recorded between six and nine in the evening. All of the stillbirth rates between noon and midnight were greater than the rates between midnight and noon. The mathematical probability that the difference in the distribution of the stillbirths and live births is merely one of chance is less than one in a million or, statistically speaking, the variation of the stillbirth rate is certainly significant.*

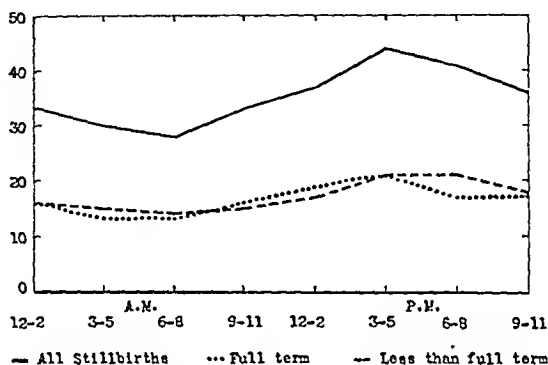


Fig. 2.—Stillbirth rates according to hour of delivery, New York State (exclusive of New York City), 1929.

Grouping the live and stillbirths according to seasons of the year we find that the excess of the maximum over the minimum rate was practically the same for each quarter (Table III).

TABLE III

	MAXIMUM RATE	MINIMUM RATE
January—March	50	29
April—June	49	29
July—September	40	24
October—December	42	29

The maximum rates were recorded at 3 to 5 P.M. with the exception of the three months from April to June when the peak occurred at 6 to 8 P.M., the next highest rate during those three months (45) falling at 3 to 5 P.M. The minimum rates were reached at 6 to 8 A.M. with the exception of January to March, when the rate occurred during the earlier hours, 3 to 5 A.M.; the rate at 12 to 8 A.M. (29) being the next smallest.

Separating the stillbirths into full term and less than full term, we have the following (Table IV).

The degree of variation of these two sets of rates, as indicated by their standard deviations, was practically the same, 2.62 and 2.50. The maximum rates of full term and less than full-term stillbirths,

*An analysis of the live and stillbirths for the first four months of 1926 showed almost the same variability of the stillbirth rate. See J. V. DePorte—Maternal Mortality and Stillbirths in New York State: 1915-1925. Published by the New York State Department of Health.

TABLE IV

HOUR OF DELIVERY	STILLBIRTH RATES	
	FULL TERM	LESS THAN FULL TERM
Midnight - 2 A.M.	16	16
3 A.M. - 5 A.M.	13	16
6 A.M. - 8 A.M.	13	14
9 A.M. - 11 A.M.	16	15
Noon - 2 P.M.	19	17
3 P.M. - 5 P.M.	21	21
6 P.M. - 8 P.M.	18	21
9 P.M. - 11 P.M.	17	18

recorded between three and six in the afternoon, were identical (21); the minimum rates (13 and 14) were recorded between six and nine in the morning.

We have thus found that the rate of stillbirths, both full term and less than full term, definitely varied according to the hour of delivery and that the variation of the total stillbirth rate was practically the same during all seasons of the year.

If this variation is not one of chance—what is the causative factor? The facts contained in this paper were brought to the attention of some of the leading obstetricians in this country; with their kind permission, we shall quote from several replies:

"It is a great surprise to me, as I should have placed it in the early morning hours, and would have attributed it to the fact that the doctor, becoming exhausted and impatient after being up a considerable part of the night, resorted to operative interference in order to get home in time for breakfast and the work of the day. This, however, is only a personal impression, and is not based upon figures." Dr. J. Whitridge Williams, The Johns Hopkins Hospital.

"Had you asked me when most of the babies died I would say between 1 and 7 A.M., basing the guess on the fact that the doctors are not at the peak of their ability during these hours. Some years ago I knew a physician who was never late to dinner, which meant that when the time came he would hurry the delivery by various measures. Possibly such action might have some bearing on the vital statistics." Dr. Joseph B. DeLee, The Chicago Lying-In Hospital.

"(I) would suggest that if it is possible to do so, you check the incidence of operative deliveries during the different time periods which you have analyzed. You might find that the incidence of operative deliveries would be higher at certain times of day than during the other periods." Dr. Fred L. Adair, University Clinics, The University of Chicago.

"The only explanation I can give, and it may be entirely erroneous is—that during the late afternoon hours there may be more operative interference and a greater use of pituitrin because of the fact that most physicians are particularly busy at this time, either in their offices or in making rounds to their different patients. In the early morning hours, on the other hand, they are perhaps slower to terminate any given case owing to the courage it takes to get out of bed at such time." Dr. Ralph W. Lobenstine, New York City, Regional Consultant in Obstetrics, New York State Department of Health.

"I feel that the real reason (for our high maternal mortality) is the lack of proper training in the medical schools. We cannot expect better results until the present requirements by the state for practice in obstetrics are changed. Only

those physicians and midwives who have received adequate training should be allowed by the state to assume the responsibility for maternity care. The delivery of at least 40 cases under proper supervision should be required.

“The extension of antenatal and postnatal work would be of great value but only if physicians properly trained are in control of these clinics. I also feel that the causative factors of puerperal morbidity and mortality are already sufficiently known and further research is unnecessary. I am sure the application of the knowledge already available by physicians and midwives properly trained would solve this problem.

“In regard to the causes of the high stillbirth rate during the afternoon hours I have only two opinions. During the afternoon there are a larger number of cases which are delivered after a long labor, as labor usually begins during the previous night or early morning. Also at this time of day physicians are usually anxious to terminate the case owing to the demands of other work. The low mortality in the early morning being due to the fact that the patients are more frequently allowed to deliver spontaneously. In one hospital where a record of time of operation was made it was found that during the night there were very few operative deliveries especially between 2 A.M. and 7 A.M.” Dr. Frederiek W. Rice, New York City—Regional Consultant in Obstetrics, New York State Department of Health.

“Afternoons are the busy hours of the doctor’s day, when we might feel more constrained to hasten deliveries.” Dr. Paige E. Thornhill, Watertown, N. Y.—Regional Consultant in Obstetrics, New York State Department of Health.

The suggestion that operative interference, by implication frequently unnecessary, is probably responsible for the high stillbirth rates in the afternoon and evening introduces a factor which is certainly within the range of direct control. In other words, it seems likely that the stillbirth rate could be reduced merely “by the application of the knowledge already available.”

Sehumacher, Paul: Intravenous Pyelography in the Pregnant and Non-Pregnant Woman. *Zentralbl. f. Gynäk.* 54: 1474, 1930.

Uroselectan, intravenously, gave very good visualization of the ureters and kidney pelves. The author previously had tried and abandoned several other preparations, one of which had resulted in a violent iodine reaction. With uroselectan the only reactions noted were reddening of the face and mild elevation of the pulse rate. The blood pressure remained unchanged. Pregnant women, because of the atony and distention of the ureters coupled with more or less urinary stasis, gave results far exceeding the author’s expectations. He is convinced that uroselectan offers a safe and effective method of obtaining pyelographies by intravenous administration of contrast material and represents a great improvement on old methods.

WILLIAM F. MENGERT.

THE PREVENTION OF OBSTETRIC COMPLICATIONS BY DIET AND EXERCISE*

BY ARTHUR W. BINGHAM, M.D., EAST ORANGE, N. J.

THE practice of obstetrics has passed through various eras. Forty or fifty years ago was the era of noninterference. Patients were allowed to go on in labor for days and sedatives were seldom used.

This was followed by an era of excessive interference. Labor was induced at any time convenient for all concerned and the baby was delivered on scheduled time, no opportunity being given for a natural birth or for the separation of the placenta. If labor did not proceed rapidly enough a cesarean section was performed.

Now we are entering the era of common sense obstetrics with more attention given to preventive treatment. An attempt is made to follow nature; sedatives are given when indicated; and care is taken not to hurry the labor. Assistance is given when found necessary. Prenatal care has done much to improve the obstetrics of today. Can it not do more?

Prenatal care is carried on along two different lines. One might be called the informative method and the other the preventive. In the first, records are kept regarding blood pressure, weight, and uranalysis, etc.; and when abnormalities are found the proper treatment is prescribed. In the second or preventive method, besides keeping these records, advice is given in an attempt to prevent complications before the signs of approaching trouble are clear.

In watching the weight of cases of pregnancy over a long period it became apparent that most of the patients who gained much weight or gained too rapidly had more complications than those who gained only moderately. The fact that a few patients have normal labors and deliveries in spite of excessive weight proves that there are exceptions to the rule and these should not mislead us. The study of a considerable number of cases has proved that in general a patient who has gained weight only moderately and who has exercised in the open air will seldom show signs of toxemia unless the kidneys were damaged before pregnancy took place.

The control of weight cannot as a rule be accomplished simply by diet. It is necessary to have the patient exercise in the open air. Many patients tell us they have so much to do about the house that they do not need to walk. This housework does not take the place of a walk in the open and a short walk should be urged for such pa-

*Read at the Obstetric and Gynecologic Section of the Academy of Medicine of Northern New Jersey, January 27, 1931.

tients after the first three months. Walking in the open improves metabolism better than anything else these patients can do, and by improving metabolism there is less toxemia and anemia. Patients in the wards are apt to show more anemia than private patients partly because they do not always get the right food but mainly because they are working in the house all day and do not get sufficient exercise in the open air.

What is overweight in pregnancy?

The average woman of medium size should not gain more than 15 or 20 pounds during her pregnancy. Stout patients should gain less and tall patients may be allowed a few pounds more. The weight should not increase quickly, as a sudden gain will frequently precipitate an attack of toxemia although the total weight may not be excessive.

The regulation of weight by diet and exercise accomplishes several things:

First, most important it helps to prevent toxemia,

Second, patients are less anemic,

Third, it makes labor easier by reducing the amount of fat in the pelvis.

A patient came to me with a history of difficult labor and forceps delivery with her first pregnancy and a more difficult delivery with the second resulting in a stillbirth. Her physician had recommended a cesarean section in the event of another pregnancy. She was two months' pregnant when first seen by me and weighed 200 pounds. It was suggested that she reduce a little and let the question of cesarean section rest. With the aid of diet and exercise she gained only 3 pounds in the next seven months. She had a very short labor and a living child was delivered by easy low forceps, the pelvis being contracted at the outlet. The baby weighed the same as the one which was stillborn ($8\frac{1}{4}$ pounds) but the mother weighed 40 pounds less than at the previous labors.

Fourth, the size of the baby is generally less than if the weight of the patient is excessive. We all know that the weight of the baby cannot always be controlled especially if the patient is quite heavy at the beginning of pregnancy as in the last case reported, but the average will weigh less if the mother's weight is kept down and the labor as a rule will be easier. The weight of the baby is influenced by the amount of exercise the patient takes as much as by the food taken. While the patient considers this the most important reason for diet and exercise, it is really the least important.

Recently a patient was delivered by me who two years ago—after a difficult forceps case, had a stillbirth weighing 9 pounds. Her external conjugate was 17 cm. and she had gained 30 pounds. This time with careful diet and exercise she gained $10\frac{1}{2}$ pounds and had a normal delivery. Baby weighed $7\frac{1}{4}$ pounds. The patient is in excellent condition as well as her baby. Many similar cases could be cited but it is not necessary to take the time.

The obstetric complications which may be reduced by diet and exercise may be stated as follows: toxemia, eclampsia, accidental separation of placenta, difficult forceps, lacerations, induction of labor, cesarean section, subinvolution, postpartum hemorrhage, postpartum shock, infections, transfusions for anemia and hemorrhage, prolonged convalescence, premature babies, stillbirths.

It is evident that if toxemia alone can be avoided and the patient's general condition improved many of the other complications can be reduced. Tables I, II, III and IV indicate some of the results which may be accomplished by controlling the weight of the patient by diet and exercise.

TABLE I

POUNDS GAINED	NONTOKIC CASES		TOXIC CASES				PER CENT MARKED TOXIC CASES	MILD TOXEMIA		PER CENT TOTAL TOXIC CASES
			ECLAMPSIA		MARKED TOXEMIA					
	PRIM.	MULT.	PRIM.	MULT.	PRIM.	MULT.				
1-10	57	75	-	-	-	-	-	1	0.7	
11-20	277	298	-	-	3	1	0.6	5	1.5	
21-30	211	253	-	-	7	2	1.8	9	5.3	
31-	54	63	2	-	4	2	6.1	3	10.6	
1-20	334	373	-	-	3	1	0.5	5	1.3	
21-	265	316	2	-	11	4	2.7	12	6.4	
Cases No.										
1-669	301	339	2	-	10	3	2.2	8	4.3	
670-1338	298	350	-	-	4	2	0.8	9	3.1	

Table I shows the normal and toxic cases in 4 groups according to gain in weight. The cases of mild toxemia are those showing a rise in blood pressure or a trace of albumin at the last prenatal visit. They were at full term and required no treatment. The total number of cases studied was 1,338 and included only patients who had been given prenatal care by me for at least four months. Hypertension and nephritic cases were omitted as they are abnormal from the start. The gain in weight was figured from the normal weight before patient became pregnant. The second grouping on Table I shows that a patient gaining more than 20 pounds is nearly 5 times as likely to become toxic as one who gains less than 20 pounds. The single mild toxic patient in the 1-10 group had two sisters who had eclampsia and her father's death was due to hypertension so that it is possible she is potentially a nephritic. All of the marked toxic cases in 11-20 group were induced so had no chance to gain more. The third grouping on Table I shows the total cases divided in half, the second half showing an improvement over the first. The improvement is not so marked as all of the cases were given careful prenatal care. There were no cases of eclampsia in the last half.

Table II shows the same grouping as Table I but in reference to cesarean section operations, inductions, and premature infants due to toxemia. All the cesarean sections due to toxemia were done on patients who had gained over 20 pounds and the percentage of inductions for toxemia was doubled. The percentage of premature infants due to toxemia was tripled. In the last half of the group the cesarean sections were reduced and 7 of the 11 cases were patients who had had previous sections. In the first half only one patient had had a previous cesarean section. Inductions were reduced as well as premature infants.

TABLE II

POUNDS GAINED	TOTAL NO. OF CASES		CESAREAN SECTIONS		CESAREAN SECTIONS DONE FOR TOXEMIA		PER CENT TOXIC CESAREAN SECTIONS		INDUCTIONS		INDUCTIONS FOR TOXEMIA		PER CENT TOXIC CASES INDUCED		PREMATURES DUE TO TOXEMIA		PER CENT PREMATURES DUE TO TOXEMIA	
	PRIM.	MULT.	PRIM.	MULT.	PRIM.	MULT.	PRIM.	MULT.	PRIM.	MULT.	PRIM.	MULT.	PRIM.	MULT.	PRIM.	MULT.	PRIM.	MULT.
1-10	57	76	1	4	-	-	-	-	1	-	-	-	-	-	-	-	-	-
11-20	235	299	5	4	-	-	-	-	4	5	4	1	0.8	1	1	1	0.3	1
21-30	227	263	4	8	1	1	0.4	1	2	1	2	1	0.6	-	1	1	0.2	1
31-	63	68	3	4	2	-	1.5	2	3	2	3	2	3.8	2	1	1	2.2	1
1-20	342	375	6	8	-	-	-	-	5	5	4	1	0.6	1	1	1	0.2	1
21-	290	331	7	12	3	1	0.6	3	5	3	5	3	1.2	2	2	2	0.6	2
Cases No.																		
1-669	321	348	11	9	3	-	0.4	6	7	7	6	3	1.3	2	2	2	0.5	2
670-1338	311	358	2	11	-	1	0.1	4	1	1	3	1	0.5	1	1	1	0.2	1

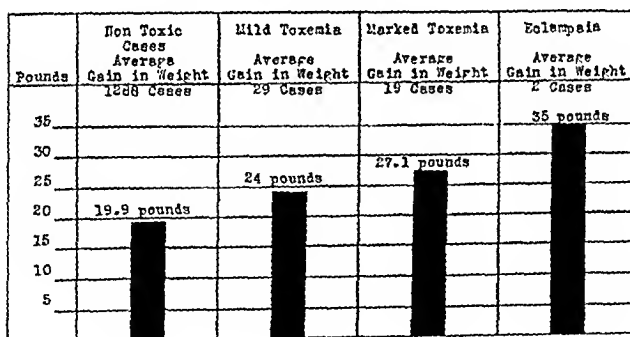
Table III shows the average weight of babies in the different groups. The babies in the 1-10 group were not undersized nor delicate and yet they weighed about 1 pound less than those in the 31 pounds + group. This pound might make quite a difference in many cases of labor. It also shows the average hours in labor; the difference being especially marked in primiparae. The last half of the group shows very little change in weight but the average length of labor has been reduced.

Table IV shows all the cases divided into 4 classes and their weights averaged in each class. The average weight of the 1,288 nontoxic cases is 19.9 pounds, the 29 mild toxic cases average 24 pounds, the 19 marked toxic cases average 27.1 pounds, and the 2 eclamptic cases average 35 pounds; showing that when a patient gains more than 20 pounds she is in greater danger of toxemia as her weight increases.

TABLE III

POUNDS GAINED	AVERAGE WEIGHT OF BABY		AVERAGE HOURS IN LABOR	
	PRIM.	MULT.	PRIM.	MULT.
1-10	6.9	7.2	10.4	6.0
11-20	7.2	7.3	13.4	7.3
21-30	7.5	7.8	14.2	7.5
31+	7.8	8.3	16.4	7.6
1-20	7.1	7.3	12.9	7.1
21+	7.5	7.9	14.7	7.5
Cases				
No. 1-669	7.4	7.5	14.9	8.2
670-1338	7.3	7.7	12.5	6.4

TABLE IV



How is this regulation of diet and exercise managed? Each patient is handled individually depending on her weight, height, normal blood pressure, and past history. As a rule there is no attempt to control the weight during the first three months of pregnancy as most patients gain very little then. It has been found that carbohydrates should be largely taken during this period. In cases of nausea they should be taken every two hours. Meat, eggs, milk, and fruit should be taken in moderation.

After three months carbohydrates should be cut down and more vegetables and fruit taken. A moderate amount of milk should be taken depending somewhat on the gain in weight. Red meats are

omitted during the last six weeks although it may be that this rule is not so important as formerly considered.

As a rule the patient is told to take a general diet for the fourth month, care being taken not to overeat. If, after one month the gain is not over 4 pounds, she may be allowed to continue on the same diet another month being cautioned to omit sweets and take starchy foods sparingly. If patient gains less than 4 pounds, she goes on for another month but if she gains 4 pounds, or more, she is told to restrict starchy foods still more. Roughly speaking the gain during the first three months will be very little, then the gain each month should be approximately 4, 3, 3, 3, 2, and 2 pounds, and the diet regulated accordingly. Often if the patient is in good condition there will be a loss of weight during the last two weeks. While the diet is being watched the amount of exercise in the open air must be prescribed.

During the first three months very little exercise is required. There will be less nausea and less danger of miscarriage if this rule is followed. However, if there is very little nausea and no danger of miscarriage a moderate amount of walking is good. After the third month, the patient should start walking about one-half hour daily and this regulated to a longer or shorter time depending on weight and general condition of patient. A few patients in danger of premature labor will not be able to walk far, while others may walk one or two hours daily. This may be continued up to the end of pregnancy.

If in spite of moderate diet and exercise, weight is increased too rapidly; before signs of beginning toxemia appear, the patient's diet is supplemented as follows: Twice weekly or every other day as indicated regular meals are discontinued and patient takes one glass of milk with one cracker at 8 and 11 A.M., and 2, 5, and 8 P.M. Two oranges are allowed during the day and possibly one green vegetable and a cup of coffee. If care is taken not to increase the diet over the average amount on the off days this will in most cases reduce or check the increase in weight without much discomfort to the patient. When weight is controlled, more vegetables and tomato or lettuce salad may be added to the milk diet on these days. Various combinations may be used. By allowing the patient to eat moderate meals on alternate days with the milk diet the weight can be controlled without the diet becoming tiresome.

CONCLUSIONS

No attempt has been made in this paper to cover the subject of prenatal care, the single idea being to emphasize a feature which is more or less neglected. Over 4,000 women die annually in the United States from toxemia including eclampsia. If by attention to diet and exercise the incidence of toxemia and eclampsia alone can be greatly reduced, is it not worth while? When I survey the obstetric cases of the

past with those of today, I realize that the work has become simpler and the results so much better that credit is naturally given to the effort to instruct patients on the subject of diet and exercise.

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219 HARRISON STREET.

ANTERIOR PITUITARY HORMONE IN THE CEREBROSPINAL FLUID DURING PREGNANCY

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SINCE Cushing and Goetsch¹ in 1910 called attention to "the presence of a substance in the cerebrospinal fluid which gave the same reactions as the pars nervosa itself," there has been extensive research regarding the presence of pituitary hormone, calcium, and other content of the fluid.^{2, 3} Whether the pituitary gland secretes directly into the cerebrospinal fluid⁴ or whether the hormone present is a filtrate from the blood stream is still a moot question. The presence of pituitary substance in spinal fluid has been studied in pregnancy and parturition.⁵ All of this work has been done with reference to the posterior pituitary hormone.

Until the epoch-making work of Aschheim and Zondek in 1927, there had not been available a test for the anterior pituitary hormone. For interpretation of the reactions obtained with this test, the German authors have selected the symbols HVR-I, -II, and -III, as referring to *hypophysenvorderlappen reaktion*. The English analogy, anterior pituitary reactions, is designated APR-I, -II, and -III. APR-I is that reaction characterized by follicle formation in the ovary and is the result of stimulation of the ovary by that element of the anterior pituitary hormone called Prolan A. The APR-II refers to the production of hemorrhagic follicles (the "*Blutpunkte*") and APR-III is the designation of corpus luteum formation. Reactions II and III are the results of stimulation by the Prolan B factor of the anterior pituitary, Squier and Wertheimer⁶ in 1929, using the Aschheim-Zondek technic, with immature female mice as test animals, performed two series of experiments with the spinal fluid of grown dogs. They were not interested in the reaction as a pregnancy test. The mice of this series gave neither the APR-I, -II, or -III. These workers concluded that the anterior pituitary hormone is not present in the cerebrospinal fluid of grown dogs. Ehrhardt⁷ reported a series of 50 cerebrospinal fluids taken by ventricle puncture, suboccipital puncture, and lumbar puncture from children, men, and women suffering from various disease conditions and also fluid from cadavers. In this series are spinal fluids, all lumbar punctures, from 18 pregnant women. He tested for the anterior pituitary substance by using the usual mouse test, substituting spinal fluid for urine. In this series

in no case was an APR-II or -III obtained. Three cases of eclampsia returned a three-plus APR-I, one portio carcinoma in pregnancy, a three-plus APR-I, and one preeclampsia and one pregnancy dermatitis each gave a one-plus APR-I. Whether the positive reaction in toxemic patients is due to an overflow of hormone from the blood due to an increased permeability of the capillary wall or to an overfunction of the anterior pituitary with direct delivery into the cerebrospinal fluid, is not determined.

One of us, in a previous paper, has discussed the Aschheim-Zondek reaction, as originally described, together with various modifications which have been offered. In this laboratory the reaction has been studied not so much as an actual test for pregnancy, but as an index to the presence of the pituitary hormone in the pregnant state. Therefore, the rapidity in the number of hours with which the reaction could be obtained, the earliest stage of pregnancy which gives the reaction,

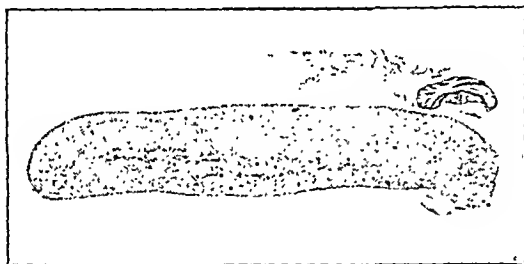


Fig. 1.—Ovary of noninjected doe.

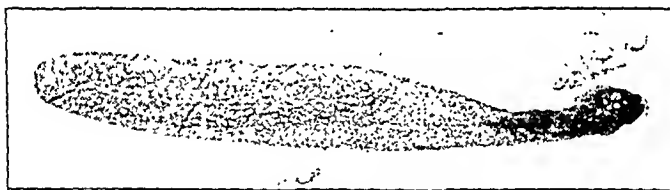


Fig. 2.—Ovary of 1200 gm. doe, injected intravenously with 3.5 c.c. cerebrospinal fluid. Autopsied forty-eight hours later. Note lack of enlarged follicles, hemorrhage, and corpora lutea.

and allied questions have not been given major consideration. The technic as performed here is to inject 3.5 c.c. of blood serum intravenously into the marginal ear vein of a 1,200 to 1,600 gm. virgin female rabbit. After thirty-six to forty hours, the animal is either killed or operated upon. The vagina, uterus, and ovaries are inspected. In a positive test the vagina is open with a mucoid discharge, the uterus is enlarged and engorged, and the ovaries are enlarged and show one or many hemorrhagic follicles, and/or corpus luteum formation, the APR-II and -III of the current literature. Positive results have not necessitated microscopic examination except as a means of permanent record or in doubtful APR-I.

The present report is a summary of experiments performed on the blood and spinal fluid of 5 pregnant women. As originally planned,

this work was to have been more extensive in character. After the five cases recorded here, the work of Ehrhardt was found and as much as the results are parallel, this report serves as a confirmation. Further tests will be performed with fluid from the toxemias of pregnancy. The procedure followed was to perform a lumbar puncture withdrawing about 4 c.c. of spinal fluid and a vein puncture withdrawing about 10 c.c. of blood. After obtaining the blood serum by centrifugation, 3.5 c.c. each of blood serum and spinal fluid were injected intravenously into rabbits of approximately the same weight. After the arbitrarily allowed time of thirty-six to forty hours, the animals were operated upon or killed and the reactions observed. By this technic we felt that as nearly standard conditions as possible were obtained and the degree of reaction of the two fluids were definitely comparable; the blood serum reaction serving as a control for the spinal fluid.

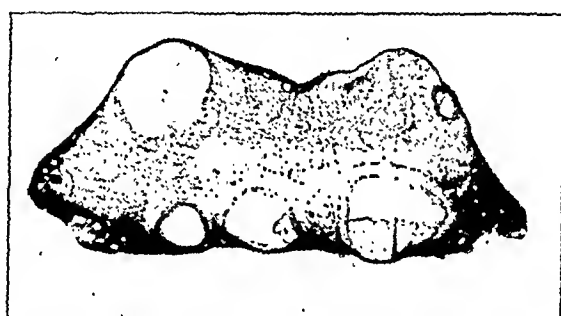


Fig. 3.—Ovary of 1300 gm. doe injected intravenously with 3.5 c.c. blood serum. Autopsied forty hours later. Note hemorrhagic follicles and beginning luteinization.

TABLE I

PATIENT	GRAVIDA	AGE	GESTATION	COLOR	ABNORMALITIES	REACTION IN RABBIT OVARY .	
						BLOOD	CEREBRO-SPINAL FLUID
L.S.	I	18	32 wk.	N	Condylomas	II and III	I (slight)
A.S.	II	32	16 wk.	W	Threatened Miscarriage	II and III	I (slight)
L.T.	II	21	24 wk.	N	Contracted Pelvis	II and III	I (slight)
M.H.	IX	28	30 wk.	N	Normal	II and III	I (slight)
V.W.	I	26	28 wk.	N	Hypertension Preeclamptic	II and III	I

SUMMARY

From our findings which are essentially in accord with the results of Ehrhardt, we are permitted to draw the conclusion that the anterior pituitary hormone or at least the Prolan B is not present in the cerebrospinal fluid or, if present, is in a much less concentration than in the blood. This seems to indicate rather definitely that the hormone element of the anterior pituitary which causes hemorrhagic follicles

and corpus luteum formation is not secreted directly into the cerebro-spinal fluid, but into the blood stream.

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SOME NOTES ON STERILITY DUE TO OBSTRUCTION IN THE UTERINE TUBES*

BY HENRY SCHMITZ, M.D., CHICAGO, ILL.

STERILITY is an intricate and extensive subject and the question of the cause and treatment of marital barrenness is one of the most difficult problems in gynecologic practice. The desire of a sterile wife mated to a potent husband to bear offspring and to submit to any measure to attain that end should be heeded.

The causes of sterility in the female are many. Sterility may be primary or secondary. It is primary if conception has never occurred, and secondary if one or more conceptions have preceded an indefinite period of barrenness.

In about one-third of all sterile marriages the male is at fault. The cervical and vaginal secretions are at times hostile to the spermatozoa. These conditions are tested by the Hühner reaction, which is valuable because of its simplicity and the definiteness of its results. Living spermatozoa in the cervical canal tell us at once that the cervix is in right position to receive the semen and that the cervical secretion is compatible with the seminal fluids. If dead spermatozoa are found then a condom test is indicated. If the latter shows live spermatozoa, then the deduction may be drawn that the husband is potent.

Obstruction in the uterine tubes the result of preceding infections is a frequent cause of acquired sterility. Giles states that about 15 per cent of all women under twenty-four years of age have closed tubes. The introduction of accurate methods of diagnosis as tubal gas inflation and the injection of aqueous solutions or oil suspensions of iodine with subsequent radiography has not only improved the diagnosis of sterility but has incited renewed interest in the treatment of this form of acquired sterility. Exploratory laparotomies are no longer justifiable to make a diagnosis of tubal obstruction as hysterosalpingography enables one to visualize the lesion and its location.

*Read before the Chicago Gynecological Society, February 26, 1931.

The therapeutic methods for the relief of tubal obstruction are, of course, surgical and the kind of operation indicated can be predetermined in the majority of cases after hystero-graphy.

Acquired obstruction of the uterine tubes is mostly of an infectious origin. The infection may reach the tubes through an ascending, descending or hematogenous route. The ascending infection is mainly a gonorrheal one, though pyogenic bacteria and those unknown specific organisms of exanthematous infections may cause it. The descending infection is produced by bacteria inhabiting the intestinal tract and found with appendicitis, sigmoiditis, tuberculous enteritis, typhoid fever, actinomycosis, among others. By continuity through adhesions the infection may invade the pelvic organs. The hematogenous infections may result from primary foci in the respiratory tract as streptococcus sore throat, pulmonary tuberculosis, acute pneumonia, etc.

Recovery of the tubes from the infection may be complete or incomplete. It is complete (1) if the cause of the inflammation is removed; (2) if the dead tissue, the inflammatory exudate, and the proliferative products are completely resorbed; and (3) if the injured tissue is replaced by normal tissue by a process of resolution or regeneration. The recovery is complete: anatomically, biologically, and physiologically. In incomplete recovery the damaged tissues are replaced by morphologically, physiologically and biologically inferior tissues. The degree and the character of an incomplete cure depend on the residual rests of the products of the inflammation, which may have been alterative, or exudative and infiltrative, or proliferative.

The dominance and persistence of the alterative form of an infection means deranged function as the surface epithelium or parenchyma is altered in this process; the dominance and persistence of the exudative or infiltrative form means a stormy course of the infection frequently accompanied by abscess formation; while the dominance and persistence of the proliferative form will lead to a protracted, lingering course of the disease. The end-results therefore are either: (1) permanent changes in the specific functional tissue and cells; or (2) infiltrative and exudative processes; or (3) persistent inflammatory tumefactions. All three changes may be found combined in acute and chronic infections.

About 75 per cent of female pelvic infections are gonorrheal, about 20 per cent pyogenic or septic, and about 5 per cent tuberculous. Pelvic infections are self-limited. If treated conservatively about 65 per cent terminate in a complete cure with restitution of normal physiologic function and normal anatomic relations; about 20 per cent end in a subjective cure, the patient is free from symptoms though pathologic changes have been left behind as atresias of the tubes and pelvic adhesions. Sterility without palpatory findings is usually present in this group. The remaining 15 per cent constitute the chroni-

cally ill patients with permanent and palpable changes in the pelvic organs. Resort to radical surgical measures alone will restore such patients to health.

These observations permit the conclusion: (1) The gonorrheal infections are the preponderant cause of tubal obstruction with acquired primary or secondary sterility. (2) The alterative and exudative forms of inflammation, if becoming chronic, probably are followed by a subjective recovery but may leave inferiorly functioning tissues or tubal atresias behind; and (3) it is in these forms of tubal infections that sterility is found.

DIAGNOSIS OF STERILITY DUE TO TUBAL OBSTRUCTION

Tubal gas inflation, hysterosalpingography and pneumoperitoneum are the newer methods of laboratory diagnosis to aid in the corroboration of the clinical diagnosis.

Pneumoperitoneum, or the introduction of filtered air or gas into the abdominal cavity and subsequent inspection with the eudoscope was done by Kelling in 1902. Jacobacus in 1910, Orndoff in 1920, and Steiner in 1924 described similar procedures. Orndoff not only employed indirect vision but added radiography. The procedure has been termed celioscopy, laparoscopy, peritoneoscopy, and abdominoscopy.

Weber in 1913 inflated the abdominal cavity with oxygen and then made x-ray pictures. Goetze in 1918 applied the method to diseases of the pelvic organs in women with the patient in the knee-chest position. Steward and Stein in 1919 placed the patient in the Trendelenburg position, produced pneumoperitoneum and then took x-ray pictures of the pelvic organs diagnosing pelvic tumors, adnexal inflammatory tumefactions, changes in size, form and position of the uterus. Goetze, Peterson, Wintz, Stein and Arcens among others made exhaustive studies of the diagnostic importance of pneumoperitoneum and roentgenography in diseases of women. The value of pneumoperitoneum with abdominoscopy and roentgenography is limited to the differential diagnosis of tumors, pregnancy, and inflammatory tumefactions.

Hysterosalpingography was introduced by Carey in 1914. He demonstrated the patency or occlusion of the uterine tubes through the transuterine injection of collargol and roentgenography. The method, however, did not come into general use until 1923 when Kennedy modified the procedure by the use of a 20 per cent aqueous solution of sodium iodide. Sicard and Forestier²³ introduced as an opaque medium a 40 per cent solution of iodine in oil of poppy, and Portret in 1923 applied this preparation in the diagnosis of gynecologic diseases especially as a complement to the Rubin test in the diagnosis of sterility. After an injection into a closed cavity the iodized oil is absorbed slowly. Even a period of two years or more may be required, but absorption is finally complete and abscess or a tumor never forms.

Hysterosalpingography enables one to visualize the site of obstruction in the tube, which may be in the intramural or isthmic portion or the abdominal ostium. It, also, may show deformities of the uterus, fundal polyps, etc. Kennedy found that about 30 per cent of obstructions were located in the isthmus. Aldridge in a series of sterility cases found that 66.5 per cent had partial or complete obstruction and in 44 per cent of these pelvic examination was negative.

Stein and Arcens, Jung and Schirmer combine hysterosalpingography with pneumoperitoneography to enhance the diagnostic findings.

Transuterine gas inflation was introduced by Rubin in 1920. The method has been universally and rapidly accepted as a diagnostic procedure in gynecology. Innumerable modifications and refinements have been reported from time to time. They consist in the development of highly complicated apparatus to inflate the genital canal, the use of oxygen and carbon dioxide instead of air, and the addition of auscultation and roentgenographic methods to demonstrate the presence of air or gas in the abdominal cavity. Yet the simpler the technical procedure the more useful will be its diagnostic value. An example is the rubber bulb air inflation method of Heaney. Transuterine gas inflation will demonstrate the openness or occlusion of the uterine tubes. It may enable one by auscultation to state whether one tube is open and the other closed, but the method cannot fix the site of the obstruction or the presence of deformities in the genital canal.

The indications for these methods of diagnosis are:

1. Sterility in the female, if potency of the male partner has been assured, the patient is desirous of offspring, and palpatory changes in the adnexa are absent.

2. Transuterine tubal gas inflation is used to test patency or non-patency of the tubes. Should the tubes be closed then hysterosalpingography enables one to locate the site of the obstruction.

3. Pneumoperitoneum should be confined to such cases where obscure pathology is found on palpation and an aid in differential diagnosis is necessary.

The use of the diagnostic measures is contraindicated:

1. In the presence of amenorrhea unless pregnancy can be absolutely excluded.

2. In the premenstrual phase of the endometrial cycle. The endometrium is then thickened and spongy and may temporarily clog the uterine tubal ostium, or endometrial particles may be forced into the peritoneal cavity where they might give rise to the formation of endometriosis. The diameter of the uterine tubes in the intramural portion is 0.8 to 1 mm. according to Zorn.

3. In uterine hemorrhages. Uterine contents as viable endometrial or cancerous debris may be forced into the pelvic cavity where they might give rise to implantation metastases, or air may enter the blood stream through the open blood vessels. Air accidentally entering the blood vessels may be dangerous causing air emboli. Oxygen and carbon dioxide are deemed harmless as they are rapidly absorbed.

4. In acute and subacute infections of the genital tract. Intra-uterine instrumentation is always contraindicated in the presence of recent infections. Control of the infection may be determined by repeated local examinations and manipulations especially near the menstrual period, the leucocytic and the differential leucocytic count, and the erythrocyte sedimentation time.

5. Profuse leucorrhea in the presence of a cervicitis. The latter should be treated and cured before the diagnostic tests are performed. It, also, is a frequent cause of sterility. Their subsidence may obviate any other treatment.

6. Advanced organic diseases of the heart, lungs and kidneys. Pneumoperitoneum necessitates the use of comparatively large amounts of gas causing subsequent embarrassment of the heart and lungs. The small amount of gas or lipiodol (5 to 10 cm.) used in tubal inflation or hysterosalpingography are without any danger. The heart, kidney and lung diseases also may render pregnancy inadvisable.

7. Disturbances of metabolism as diabetes mellitus, dysfunction of ductless glands. Metabolic disturbances are often a cause of sterility due to ovarian dysfunction, while endocrine imbalance as evidenced by adiposity, infantile uterus may bar conception and therefore should be corrected first, before any further examinations or treatment are done.

The technic of tubal inflation and hysterosalpingography need not be discussed. It is of importance to note that the test should be performed during the second week of the ovarian cycle and that it should be repeated after an interval of a month if negative results were obtained. The x-ray picture should be taken ten to fifteen minutes after the injection of oil. Uterine and tubal spasms take place preventing the oil from immediately entering the tubes. When retraction occurs the tubes fill rapidly and the oil is spilled into the pelvic cavity.

SURGICAL TREATMENT

Stricture of atresia of the isthmic and intramural portion of the tube requires resection and reimplantation of the tube according to the technic advised by Strassmann. To determine the point of resection of the isthmic portion of the tube, the Curtis procedure of retrograde inflation of the tube through the abdominal ostium with a glass or rubber bulb syringe should be used. Closure of the abdominal ostium indicates salpingostomy as first advocated by A. Martin. Absence of both tubes or degeneration or disease requiring their removal may make the implantation of a healthy ovary attached to its normal blood and nerve supply into the uterine cavity advisable. Estes, Tuffier and others have written extensively on this subject.

Pregnancies with full-term labors after tubal implantations have been reported by Strassmann, Shaw, Nowak, Unterberger, and others. Watkins performed such an operation followed by a full-term pregnancy as early as 1899. The operation is also indicated after the removal of cornual adenomyomas, after intramural and isthmic pregnancies and after tubal sterilization operations. Success will be much better in these noninflammatory obstructions.

In 429 cases of salpingostomies collected from the literature 43 full-term pregnancies occurred, that is 10.03 per cent. Gellhorn states that

plastic operations on the tubes are justifiable in tubal occlusion from tubal pregnancy, chronic appendicitis, hydrosalpinx and hematosalpinx. The mucosa of the tube should be normal.

To maintain patency after salpingostomies and resections a twig of chromic catgut should be inserted through the abdominal ostium into the uterine cavity and tied to the ostium. Rubin and others advise repeated gas inflations at ten-day intervals following operation. We insert a twig and use hysterosalpingography monthly for this purpose.

Ovarian transplantations for the cure of sterility have raised more controversial discussions and claims in medical literature than the other operative procedures for sterility. Pregnancies after ovarian grafting or transplantation have been reported by Polk, Norris, Frank, Dudley, Stone, Bainbridge, Sippel, Tuffier, Estes, Gellert, and others. Sellheim places the number of full-term pregnancies after ovarian transplantation at about 10 per cent.

Estes performed within twenty years 45 operations and had 5 or 11.11 per cent full-term pregnancies. He amputates the uterine cornua slantingly until an opening to the uterine cavity is established. The defect is covered with the hemisected ovary left attached to its blood and nerve supply. Tuffier, Bell and Sellheim make an opening in the posterior uterine wall and then insert the whole ovary left attached to the uterine blood and nerve supply. Care must be had not to compress the pedicle when closing the uterine wall.

Tubal transplantations and salpingostomies have been done by us fifteen times. In two instances pregnancy followed afterward. One patient following an acute appendicitis had a right salpingectomy and a left salpingostomy and has had three full-term normal labors. Primary sterility had existed for four years. Ovarian implantation has been done once. The patient when fifteen years old had an operation for acute appendicitis. The appendix, the tubes, and the left ovary were removed. The earnest request of husband and wife induced us to perform the operation.

DISCUSSION

The treatment of sterility due to acquired atresia or aplasia caused chiefly by infections deserves our earnest attention. The desire of a barren wife mated to a potent husband to bear offspring and to submit to any measure to attain that end should be heeded. The newer diagnostic measures which have been discussed enable the gynecologist to visualize anatomic changes in the genital tract, and especially in the uterine tubes. It is possible, thereby, to determine the indicated method of surgical procedure. Exploratory laparotomies are certainly not any more justifiable. The success of surgical treatment probably depends on the presence of a normal tubal mucosa. The efficacy of the operation should be tested by repeated air inflations and hystero-

salpingographies. Thereby reocclusions, especially of the abdominal ostium may be forestalled. The transplantation of an ovary into the uterine cavity in the absence of both tubes has shown the same percentage of full-term pregnancies as salpingostomy. A careful follow-up of all cases is the only means to settle the value or uselessness of the plastic operations.

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25 EAST WASHINGTON STREET.

(For discussion, see page 135.)

ON THE ORIGIN OF OVARIAN EPITHELIUM*

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THAT there is no true epithelium in the normal ovary is a fact familiar to those who have studied its histology. That true epithelium is found in pathologic ovaries is equally well known. Klebs, Waldeyer, Hoffstetter, Goodall, Nagel, Marchand, Pfannenstiel and

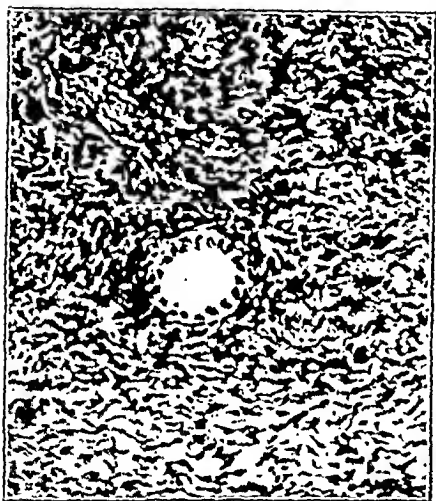


Fig. 1.

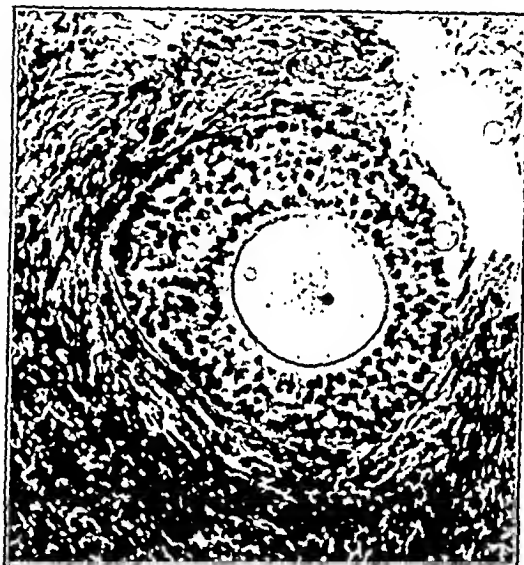


Fig. 2.

Fig. 1.—(18066) Showing a graafian follicle beginning to develop. The ovum is missing. The space is slightly enlarged. The cells have increased in number and become larger and are arranged in a single definite layer lining the space.

Fig. 2.—(3001-E) A graafian follicle well started on its growth. The space is very much enlarged. The ovum is many times larger than the entire undeveloped follicle and shows the nucleus and nucleolus. The granulosa cells have increased in number and fill up all the space except that occupied by the ovum. There are no appreciable changes in the stroma.

many others have presented extensive observations and many theories have been evolved but no agreement reached. Kaufmann says, "Pfannenstiel believes that the pseudomucinous cysts arise from follicle epithelium, but no one has as yet observed a transition of follicle epithelium into epithelial goblet cells as in glands." If the origin of the epithelium found in the pathologic ovaries can be traced, the explanation of the formation of multilocular cysts and all other abnormal epithelial growths of the ovary would be comparatively easy. The tracing of

*Read at a meeting of the Baltimore Obstetrical and Gynecological Society, January 9, 1931.

one source of this epithelium and the demonstration of the manner of its growth is the object of this study. So far as I have been able to learn, this is the first demonstration of the transition of graafian follicle cells into true epithelium.

The cortex of the ovary consists of a dense stroma of connective tissue in which are embedded the graafian follicles. The undeveloped

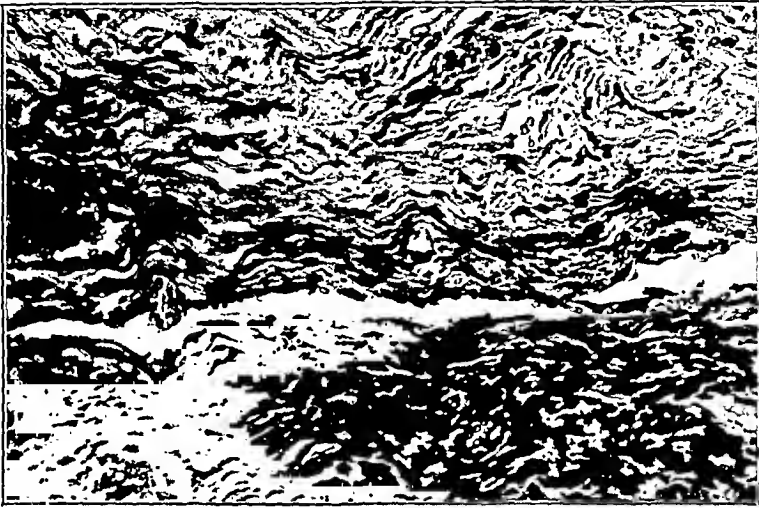


Fig. 3.—(18615-A) The cells of the corpus luteum have become definite connective tissue cells but have not undergone hyalinization. The line of cleavage between the connective tissue cells of the cortex and those derived from the granulosa cells shows conclusively that the connective tissue that replaces the corpus luteum is not derived from the cortex but is the result of the direct transition of lutein cells into connective tissue cells. If this were not the case there would be no clear line of cleavage but the two would be fused.

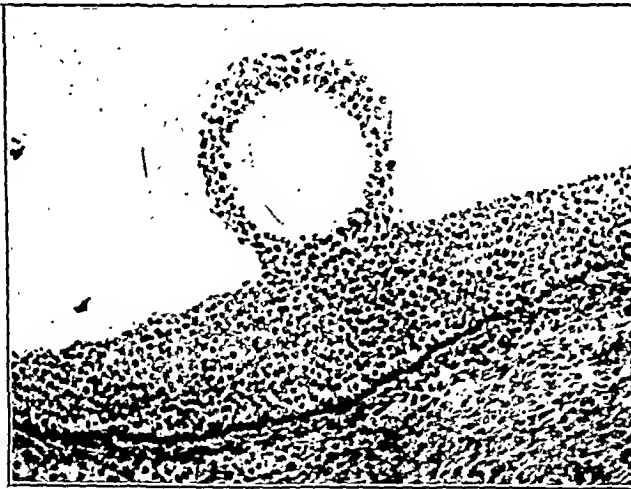


Fig. 4.—(6287-C) Degenerating ovum; waning discus proligerus; granulosa cells. The impulse which starts the graafian follicle to develop does not always continue and instead of a corpus luteum forming there is, as in this instance, a decrease in the size of the granulosa cells. They become spread out over the inner surface of the cavity and the discus proligerus becomes smaller. The fluid in the space gradually increases and the increased pressure tends to further thin out and decrease the size of the granulosa cells. In this way are formed the small graafian follicle or atretic cysts which are present in nearly all ovaries.

graafian follicle is a very simple structure, consisting of a small space lined by a single layer of cells and enclosing usually a single ovum. Only a very small percentage of the follicles present in an ovary ever develop. The vast majority disappear without leaving a trace. When a follicle receives the impulse that causes it to develop, there is at first an enlargement of the space which is completely filled by the lining cells, greatly increased both in size and number and by the ovum which also is increased in size. A little later a clear space is formed between the cells. As the fluid in the clear space increases a cavity is formed. The cavity in its entire extent is lined by numerous layers of unstratified, rounded cells; but on one side the cells are

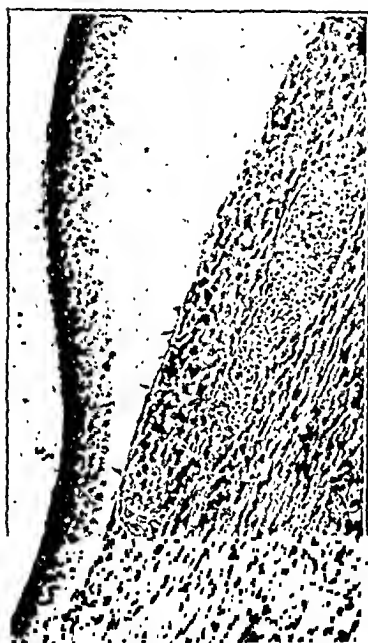


Fig. 5.



Fig. 6.

Fig. 5.—(4509-D) The granulosa layer of a small cyst has been spread out over a considerable area, showing the easy detachment of the granulosa cells from the ovarian cortex.

Fig. 6.—(15687) In multilocular cysts, spaces are found which are lined by columnar epithelium. This epithelium is higher and more easily made out in the smaller spaces; because the tension in the smaller cavities is less and the epithelium has been subject to less internal pressure. This photomicrograph was made from a small multilocular cyst and illustrates the type of cells that secrete the mucilaginous content of the cysts.

heaped up around the ovum forming the discus proligerus. These cells are very clannish. They live very close to the cortex cells, but there is always a line of cleavage between them and the cortex cells so that they never intermingle. From these cells is formed the corpus luteum, which in the process of recession becomes first ordinary connective tissue and later the corpus albicans which is a connective tissue mass undergoing hyalinization.

In other words the cells lining the graafian follicle in the course of normal growth are converted into connective tissue cells. As the graafian follicle develops there are changes in the cortex of the ovary immediately surrounding the follicle. The connective tissue cells of the cortex become larger, rounded and vesicular. But there is never at any time an intermingling of the cortex cells with those originally within the graafian follicle. There is always a line of cleavage between these cortex cells and the cells originally lining the graafian follicle and all cells derived from them. The changes in the connective tissue cells of the cortex are somewhat analogous to the changes in the stroma cells in the endometrium during pregnancy or those seen in the connective tissue of the tube in an extrauterine pregnancy. These

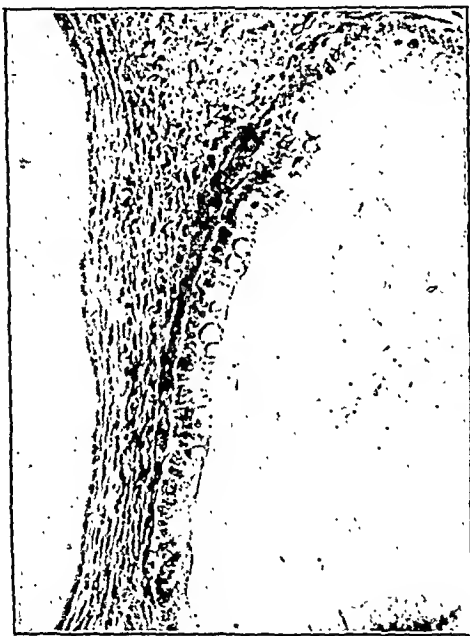


Fig. 7.



Fig. 8.

Fig. 7.—(11207-B) Showing two cavities in one field, one lined by epithelium and the other by compressed granulosa cells. In another part of the latter cavity, the granulosa cells are more numerous than in the part shown.

Fig. 8.—(16162-B) This picture is taken through a lens of low magnifying power. It shows the whole of one small cavity with its continuous cell lining. The following three pictures show the various types of cells in this uninterrupted lining and the direct transition from granulosa cells to epithelial cells. This one space shows granulosa cells such as are found only in degenerating graafian follicles, and in tracing the unbroken lining of the cavity it is seen that there is a gradual transition from this type of cells to columnar epithelium. (A, B, and C, see also legends of Figs. 9, 10, and 11.)

modified tissue cells of the cortex are divided into two layers; the theca interna and the theca externa. The change in these cells is apparently solely a process of softening the firm connective tissue by which the graafian follicle is surrounded, in preparation for the rupture of the follicle and the freeing of the ovum. If the graafian follicle ceases to develop, as frequently happens, the cortex cells promptly return to their original state.

Many graafian follicles after they have begun to react to the impulse of development do not continue the course to completion as outlined above, but for some reason the process stops, the follicle becomes distended with fluid and a small cyst is formed. Occasionally in one of these cysts an ovum is found still surrounded by its shrinking discus proligerus. The remainder of the cyst is lined by the same type of cells found in the developing follicle, but they have decreased in size. The size of the cells and their number vary with the age of the cyst and the tension in it. In the more recently formed cysts the cells are very numerous and are heaped up in unstratified layers. In the older cysts they are thinned out sometimes to a single layer. Around these cysts both the theca interna and externa have receded and are not



Fig. 9.

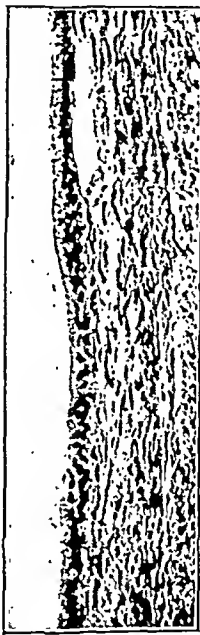


Fig. 10.

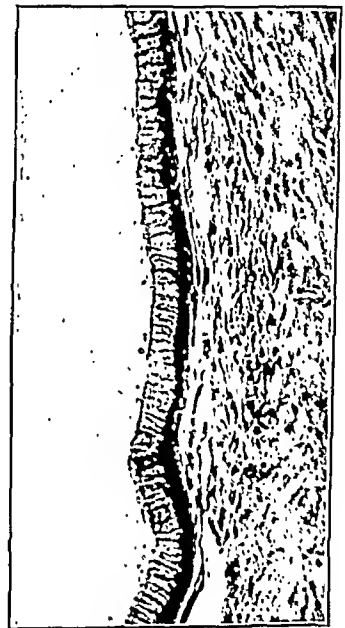


Fig. 11.

Figs. 9, 10, and 11.—Photomicrographs of the lining of this cavity taken at three different points.

Fig. 9.—At this point the lining is made up of unmistakable granulosa cells. (A in Fig. 8.)

Fig. 10.—Here the lining approaches the appearance of definite epithelium. (B in Fig. 8.)

Fig. 11.—Columnar epithelium. (C in Fig. 8.)

recognizable. The lining of these cysts lies loosely upon the cells of the cortex and is easily detached from them. Cysts of this type occur in practically all ovaries and are of very little clinical or pathologic significance.

The ovum and its surrounding cells in the follicle are of the same embryologic origin. No one speaks of the ovum as an epithelial cell, though it is common to call the other cells germinal epithelium. The ovum is only one of a group that develops differently from its associates. Under influences that we trace but do not understand, the fertilized ovum produces every type of cell in the body. Why then

cannot cells that have a common origin with it and are very closely related to it, most of the time, under what we recognize as normal conditions, develop into connective tissue cells and under other influences of which we know nothing, be converted into epithelial cells? That this conversion does take place can be demonstrated beyond a reason-

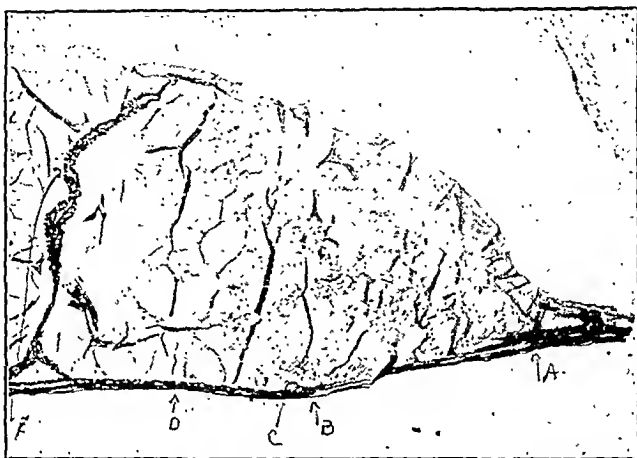


Fig. 12.—(18009-A) This slide carries the changes a little further than that shown in Fig. 8; for here are shown in one cavity, lutein cells, granulosa cells, the gradual transition from granulosa to epithelium and the fully developed epithelium.



Fig. 13.—Showing lutein cells in the cavity and resting upon the ovarian cortex.

able doubt. For this reason the term germinal epithelium should be dropped and some name given to these cells, which is more in accord with their normal processes of development.

For the present the term granulosa cells is sufficiently noncommittal to be useful and will be applied to the cells of the graafian follicle when they are neither definitely connective tissue nor epithelium.

It has been thought to be unnecessary to reproduce pictures either of the normal undeveloped graafian follicle, the corpus luteum, or the corpus albicans. All are perfectly familiar to every one who has



Fig. 14.

Fig. 14.—The right side of the small mound is covered only with compressed granulosa cells with no indication of true epithelium.



Fig. 15.

Fig. 15.—Granulosa cells on the top of the mound and the gradual transition into epithelium to the left.

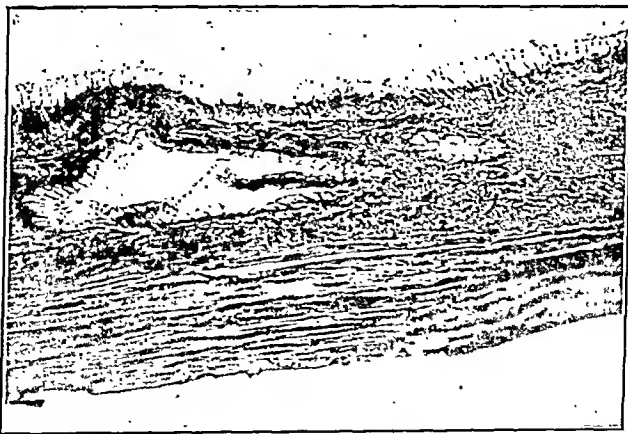


Fig. 16.—Showing completely developed epithelium of the type commonly found in multilocular cysts. Just beneath is the ovarian cortex.

paid any attention to the histology of the ovary; but a transition stage between the corpus luteum and the corpus albicans is shown. The illustrations of the normal development of the graafian follicle are inserted to clear up certain misconceptions in regard to this process

which are prevalent and which have added confusion to a simple, normal progression.

CONCLUSIONS

1. The cells surrounding the ovum in the graafian follicles are undifferentiated cells that are capable of developing in more than one way.
2. Under what may be called normal stimuli they develop into connective tissue.
3. Under other stimuli they develop into true epithelium.
4. The transition from normal cells into epithelial cells can be definitely traced.

1025 NORTH CALVERT STREET.

(For discussion, see page 142.)

BREECH PRESENTATIONS, REPORT OF 170 CASES*

BY ROY W. MOHLER, M.D., PHILADELPHIA

INFANT mortality is very high for babies presenting by the breech. Every group of obstetricians should know of the mortality in their service and try in every possible way to lower it. In order to accomplish this, they should analyze their series of cases and determine what has been accomplished or neglected, and then aim to carry out those procedures which have proved advantageous. It is with this idea in mind that this report is given.

At the Philadelphia Lying-In Hospital there have been 170 breech deliveries in the period extending from April 1, 1927, to October 31, 1930. No breech presentations which were delivered by cesarean section have been included.

At the Philadelphia Lying-In Hospital the following methods of delivery have been carried out over the period of time represented by this report. During this time there were 65 spontaneous breech deliveries, all were small babies or very rapid deliveries. There were 38 extractions, which means that the baby was guided through the pelvis and the normal mechanism of labor was facilitated. There were 40 extractions with the application of forceps to the after-coming head. There were 23 babies decomposed and extracted and forceps were applied to the after-coming head, and there were 4 in which the method of delivery was not stated.

The series of 170 cases which we are reporting is not large as compared with many that have been reported. The infant mortality of the various reports varies greatly depending upon the exclusion of the premature infants and macerated infants above a certain weight, de-

*From the Philadelphia Lying-In Hospital, Philadelphia, Pa.

Read before the Obstetrical Society of Philadelphia, March 5, 1931.

formed babies, etc. Until there is some standard method of classification adopted we cannot compare statistics well. I have, therefore, included all cases which presented by the breech and were delivered by vagina. The 170 patients which form the basis of this report were

TABLE I. OUTLINE OF CASES

		PER CENT	PRIMIP- ARAE	PER CENT	MULTIP- ARAE	PER CENT
No. of cases	170		62	36.4	108	63.6
No. of live babies	110	64.6	40	64.5	70	64.8
Gross mortality	60	35.4	22	35.6	38	35.2
Group 1—Babies under 3 pounds	33	19.3	12	19.3	21	19.3
Group 1—Macerated fetus weight not given	5		1	1.5	4	3.8
Group 1—Total No. of babies	38	22.3	13	20.9	25	23.1
Group 2—No. of babies dead which weighed over 3 pounds. Table II	9	5.3	5	8.0+	4	4.0

classified as 62 primiparae and 108 multiparae. There were 40 live healthy babies discharged from the hospital which were delivered of the primiparae and 70 live healthy babies discharged from the hospital which were delivered by multiparae. There were 60 babies delivered by the breech which were lost, this represents a gross mortality of 35.4 per cent. I have arranged these cases in three groups. In Group 1 there were 33 babies weighing three pounds or less and could not be expected to survive. There were 5 more which weighed over three pounds but were premature and macerated. This would indicate that breech pregnancy has a very great chance of ending prematurely. In clinic cases, patients are difficult to control, and it seems quite impossible to lower this mortality from prematurity. In

TABLE II

CASE	PARA	WEIGHT OF CHILD		FETUS	TIME OF DEATH	AUTOPSY
4560	i	7 pounds	4 ounces	Macerated	One week before birth	No
5150	i	4 pounds		Body torn from head	Before admission to hospital	No
2670	i	3 pounds	12 ounces	Born alive Cord about neck	Few hours after delivery	No
3812	i	5 pounds	4 ounces	No pulsation in cord	Before birth after labor began	No
18427	i	3 pounds	8 ounces	Macerated	Before labor	No
1477	iv	5 pounds	5 ounces	Hemorrhage of newborn Syphilis	Seventh day post-partum	Yes
1158	iv	Not given; six months		Small	After delivery	No
2908	ii	3 pounds	9 ounces	Premature	After delivery No injury	No
19618	ii	4 pounds	8 ounces	Macerated; premature separation of placenta	Seven days before delivery	

Group 2 there were 9 babies that weighed over three pounds which died or were stillborn, their cause of death is noted in Table II and was not due to any accident of delivery, which could have been controlled in the hospital.

In Group 3 there were 13 babies which we feel were lost because of birth trauma and I shall give briefly their history.

CASE 3966.—Primipara, aged sixteen, colored, diagnosis not made until in labor, frank breech, cervix fully dilated and effaced, descent to mid pelvis. No progress with labor, decomposition and extraction with forceps to after-coming head, weight of child 8 pounds 6 ounces. Pelvic measurements were normal, difficult extraction because of size of child's head, child lived ten minutes after delivery. Autopsy showed subdural hemorrhage and tentorial tear.

CASE 4692.—Primipara, aged thirty-one, membranes ruptured, contracted pelvis recognized under anesthesia, prolapsed cord, did not pulsate during pains. Weight of child 5 pounds 4 ounces, cervix dilated manually, breech decomposed and extracted with forceps to after-coming head. Autopsy showed no gross lesions, death possibly from asphyxia due to prolapsed cord.

CASE 4139.—Primipara, aged twenty-eight, foot presenting at vulva, hard labor pains, cervix fully dilated and effaced, difficulty with nuchal arms and extended head. Extraction with forceps to after-coming head, baby born alive, lived twenty-four hours, weighed 7 pounds 13½ ounces. Autopsy showed a subdural hemorrhage with clots.

CASE 3894.—Primipara, aged thirty-four, cervix completely dilated and effaced, no progress in second stage. Measurements were normal, easy extraction with forceps to after-coming head. Baby weighed 6 pounds ½ ounce. Born dead. Autopsy showed a fracture of the seventh cervical vertebra with spinal cord completely severed.

CASE 5193.—Para ii, aged twenty-eight. First labor was spontaneous and short, baby presented by vertex. Pelvic measurements were normal, cervix completely dilated and effaced, breech was decomposed and fetus extracted with forceps to after-coming head. Baby weighed 8 pounds 6 ounces and died twenty-four hours after delivery. Autopsy showed a bilateral tentorial tear.

CASE 6227.—Para vi, aged thirty-three. All previous labors spontaneous except one easy forceps, emergency case sent into hospital with breech impacted for twenty-four hours. Breech was decomposed, baby extracted with forceps to after-coming head. Baby weighed 8 pounds with large head, died fifteen minutes after delivery. No autopsy was done but history suggested intracranial injury.

CASE 1658.—Para iv, aged twenty-seven. All previous labors were spontaneous. Breech was decomposed and extracted after full dilatation, and effacement of cervix. Baby weighed 8 pounds 6 ounces, died during labor. Autopsy was not performed but history suggested asphyxia or fracture of the skull.

CASE 3341.—Para v, aged twenty-six. Emergency case. Babies were lost in two previous labors. Breech had been impacted for forty-eight hours, large post-mature baby which weighed over 8 pounds. Baby was decomposed and extracted, craniotomy performed to remove after-coming head. Uterus was ruptured and hysterectomy was performed soon after delivery. Patient recovered from the delivery and operation and died on the thirteenth day after operation of a hemorrhage from bowel, the source of which could not be determined by autopsy. This is the only maternal death of the series.

CASE 3423.—Para iv, aged twenty-eight, colored, one living child, two dead children, none stillborn, previous labors were spontaneous with vertex presenting. Long first stage of labor, cervix fully dilated and effaced, no progress in second stage of labor. Decomposition of breech and extraction of 6 pound fetus, both arms became nuchal, head extracted with forceps. Autopsy of fetus showed a fracture of fifth and sixth cervical vertebrae, compression of cord and subdural hemorrhage caused by laceration of dura covering the coronal suture. The patient had a contracted pelvis which was recognized in pregnancy but because of other spontaneous labors was not considered seriously as a cause for dystocia.

CASE 811.—M., para vi, breech extraction of baby weighing 9 pounds, no difficulty in operation. Baby died on fifth day of intracranial hemorrhage.

CASE 2604.—Para ii, aged thirty. First labor was spontaneous easy vertex. Admitted to hospital without prenatal care. Diagnosis made in labor, cervix was not completely dilated or effaced. Had been in labor six hours. Breech decomposed and extracted after-coming head, delivered with forceps. Baby weighed 6 pounds 1 ounce. Autopsy showed a tentorial tear. This patient was delivered by house officer, and it seems from history that better results could have been secured by waiting until the first stage of labor was completed.

CASE 4796.—Para iii, aged twenty-nine. Two previous spontaneous labors at home. Patient had a large pelvis. Left foot of baby was presenting; cervix fully dilated and effaced after ten hours' labor. Easy extraction without traction. Head was delivered easily without forceps. Baby weighed 12 pounds. Baby died soon after birth. Autopsy showed a complete tentorial tear.

McKEE CASE 5004.—Para ii, aged thirty. Previous labor was normal, forceps had been applied to vertex when head was on perineum. Pelvic measurements were normal. Long first stage labor, no progress in second stage after complete dilatation and effacement of cervix. Breech was decomposed and a 7 pound 3 ounce baby extracted. Cord was edematous, no pulsation noted during labor. Baby was dead at birth. Cause of death was pressure on cord during second stage of labor. No autopsy.

It is the analysis of the accidents occurring in Group 3 whose histories I have just reviewed from which we wish to draw our conclusions. These deaths represent about a 10 per cent fetal mortality or 13 of the 123 viable babies or 13 babies from 170 breech pregnancies were lost from some accident of delivery. Eleven of these received intracranial injuries sufficient to prove fatal. Three of these were delivered of primiparae and 8 of multiparae. Eight of the 11 babies dead of cranial injury weighed approximately 8 pounds or over. The other two deaths were due to prolapsed cords, one was a primipara whose baby weighed 5 pounds 14 ounces, the other a multipara whose baby weighed 7 pounds 3 ounces. It is generally agreed that prolapsed cord is a frequent cause of death in babies presenting by the breech. A certain number of such cases can be controlled by carefully watching the patient throughout labor. We do not feel that these accidents require any apology or explanation. The incidence of deaths from this cause would have been about the same in cases presenting by the vertex.

TABLE III

		PER CENT	PRIMIPARAE	PER CENT	MULTIPARAE	PER CENT
No. of cases in groups 1 and 2 as shown in Table I	47	27.6	18	28.9	29	27.1
No. of babies in Group 3 dead during labor or later	13	7.9 of 170 cases 10.5 of 123 cases	4	6.4 of 62 cases or 10% of 44 cases	9	8.3 of 108 cases 11% of 79 cases
Babies dead of cranial injuries	11	6.5 of 170 cases 9% of 123 cases	3	4.8 of 62 cases, 6.8 of 44 cases	8	
Babies dead of prolapsed cord	2		1		1	
Babies over 8 pounds; whole series	26	15.3	3	4.8	23	21.0+
Babies over 8 pounds lost in labor	7+		1+	33.0	6	25.0-

In the whole series of the 170 patients there were 23 multiparae and 4 primiparae who delivered babies weighing about 8 pounds or over. This confirms the impression that usually multiparae deliver larger babies than primiparae. Six of the 23 multiparae and 2 of the 4 primiparae with babies weighing near 8 pounds or over lost their babies because of intracranial injuries directly due to delivery. This represents a mortality of approximately 30 per cent which is three times greater than the mortality of all viable babies in the entire series. If a deduction can be drawn from this small number of cases, we may say that a baby weighing 8 pounds or over has only a 70 per cent chance of being born alive if presenting by breech, and delivered vaginally.

How shall these cases be managed? The man who has had a large experience in the management of breech presentations could have managed successfully the vaginal delivery of some of these cases; in a large hospital service there are times when the breech will not have been recognized during pregnancy, the resident staff or a man with limited experience in handling breech labors will at times be forced to manage them. It would seem that recognition of the breech is imperative, in all doubtful cases x-ray should be used for diagnosis. The size of the child should be determined, it is usually possible to judge fairly accurately as to whether it is large or not. If in doubt the method of Thoms, which adapts the perforated lead plate to a plane which corresponds to the plane of the inlet of the pelvis may be adopted. If the baby is then considered large, the expediency of doing a cesarean section must be considered.

There are some who believe that all primiparae thirty-five years of age or older should be delivered of a breech by a cesarean section. Instead of this dictum we should accept the one that all breech babies which weigh over 8 pounds should be delivered by cesarean section, if the assurance of a living child warrants the additional risk to the mother. It should always be planned to do an elective section when possible. This dictum should be accepted only by trained obstetricians.

In drawing conclusions from this series of cases, we should first recommend that all cases of breech presentation should be studied very carefully during the prenatal period. Each obstetrician should aim to be present at as many breech deliveries as possible so as to constantly keep himself in practice by managing breech labors frequently. Finally the size of the child should be considered more in the management of the breech presentation, than the age and parity of the patient.

HYSTEROTOMY AND STERILIZATION

By A. M. MENDENHALL, M.D., INDIANAPOLIS, IND.

IT IS interesting to note the paucity of literature on these subjects and equally interesting to speculate on the possible reasons. Even though hysterotomy, reserving this term to mean opening the uterine fundus prior to viability of the child, has been mentioned and done for many years, yet very few writers have published articles which definitely discuss the subject.

In 1912 Deaver¹ published an article on hysterotomy in which he presented strong arguments for its more frequent use. However he advocated it in some cases so contrary to the established ideas of obstetric surgery that his paper received very unfair criticism and failed to receive proper consideration. Nevertheless he then recommended this operation in certain cases which are today handled by progressive obstetricians the world over exactly as he suggested.

In 1928 Williams² published an article on sterilization in which he discussed the indications in a rather larger group than had heretofore been considered, including "social conditions."

For the operation of therapeutic abortion there seems to be little argument left in favor of the cervical route. In uncontaminated cases a properly performed hysterotomy should carry no more hazards than cervical dilatation and curettage. It required a general surgeon¹ to call our attention nearly two decades ago to the "unsurgical" manner in which we were doing our therapeutic abortions.

It matters not whether an abortion by way of the cervix is to be done in a one- or two-stage procedure, it requires an anesthetic and cervical dilatation. Cervical dilatation carries with it the danger of considerable trauma and shock. No matter what the instrument used inside the uterus, there is the danger of perforation and the operator is never quite certain that all the products of conception have been removed. To aid the complete emptying of the uterus and to control hemorrhage he usually packs. The packing is later removed and it is merely hoped the uterus is empty.

Considerable blood loss often occurs at the so-called one-stage operation, and then the patient continues to bleed for many days or weeks or until another curettage is needed to remove the tissue missed at the first operation.

All of this is done through one of the most constantly infected areas of the body and one is never quite secure as to whether the patient is infected until several days following this "unsurgical" procedure. And finally this operation offers no opportunity to sterilize.

On the other hand in preparation for hysterotomy one can much more positively disinfect the skin of the abdomen than the vaginal field. Opening the uterine fundus early in pregnancy incurs but a very slight blood loss and a few sutures close the uterine wound securely. The uterine contents are removed by sight, leaving no doubt as to whether there is any tissue left behind. The curette is not necessary. The gloved finger, possibly covered with sterile gauze, is the only instrument needed inside the uterus at this operation. The cervical canal is not and should not be disturbed and infection is reduced practically to zero. A later operation will not be necessary and recovery is prompt. Fundamental principles of antisepsis, conservation of blood, complete operation by sight are all enhanced by hysterotomy as against the vaginal route for therapeutic abortion.

Furthermore a very high percentage of patients needing therapeutic abortion also need sterilization rather than repeated therapeutic abortions and the abdominal route offers opportunity to sterilize.

An outstanding contraindication of course to this operation would be a suspicion that the contents of the uterus are already infected. In this we cannot support Deaver's recommendation to remove secundines or placental tissue by hysterotomy. The danger of infection is too great and all such cases, possibly excepting some cases of placenta accreta, should be operated by way of the vagina.

In discussing sterilization in this paper it is to be understood that we are discussing it as a definite operation in itself and not as an operation rendered unavoidable in connection with other pelvic surgery. Volumes have been written in recent years on birth control and eugenics and much more will have been written before these questions are completely settled, nevertheless as medical men, we are continually confronted with the need for their solution.

Medical men are applying themselves more and more to preventive measures. Is not birth control in many instances a form of preventive medicine? Is not the prevention of pregnancy in an advanced cardiac, nephritic, or tuberculous patient a form of prophylaxis? To do a therapeutic abortion on these cases and still leave them in a condition where pregnancy, defined many years ago by Mauriceau as "a disease of nine months' standing," may recur, is certainly out of harmony with this day and age. Birth control propagandists and contraception advocates to the contrary notwithstanding there is no method yet known which is sufficiently dependable to be relied upon in cases where pregnancy is a serious menace. The only procedure which can be depended upon other than sterilization, is sexual continence and it is folly to expect this in the average married couple. Furthermore if followed over long periods of time, it is not without risk to physical and mental well-being.

There remains some difference of opinion among obstetricians as to methods of sterilization. The procedure considered most dependable and followed by most operators is that of excision of the isthmial portion of each tube and closure of the wound in the uterine cornua. This, if done carefully, should greatly reduce the dangers of subsequent pregnancies. In so far as I have been able to follow up my own cases no pregnancies have occurred and many other operators have had no failures.

Following is a list of cases selected from my records to illustrate several conditions for which sterilizations and hysterotomies have been done. It will be noted that in every case where a hysterotomy was indicated, I believed it also necessary to sterilize, though it is admitted there may be a rare case where a hysterotomy might be indicated and yet give the patient a chance to recover from the illness and later become pregnant.

MENTAL

B. (No. 3054), para i, aged twenty-one. Feeble-minded congenital moron, never passing first grade in school. A state charge. Hysterotomy and sterilization.

S. (No. 1376), para iii. Rheumatic heart since a child, double mitral and broken compensation. Recent embolism, catatonia. One living child; one born alive but soon died of congenital anomalies. Cesarean section and sterilization.

C. (No. 21, 820), para i, aged fifteen. Imbecile, high grade moron. Sydenham's chorea. Syphilis and gonorrhea. A state charge, Hysterotomy and sterilization.

S. (No. 5551), para v, aged thirty. Feeble-minded; husband insane maniac. Two children idiots and two children feeble-minded. Cesarean section and sterilization.

D. (No. 2925), para i, aged twenty-five. Epilepsy since a child, worse since pregnancy. Father died in insane hospital. Albuminuria. Cesarean section and sterilization.

S. (No. 3054), para i, aged eighteen. Imbecile, Court recommends sterilization. Cesarean section and sterilization.

F. (No. 6376). Confined in insane hospital. Husband epileptic. Fifteen pregnancies in sixteen years. Sterilization in puerperium.

G. (No. 3081), para v, aged twenty-nine. Chorea and psychoneurosis. Almost complete deafness. Four-plus Wassermann. Bad family history. Unable to take care of herself. Four living children. Hysterotomy and sterilization.

DISPROPORTION

C. (No. 2226), para ii, aged twenty-eight. Chronic pyelitis, tachycardia, justo minor pelvis, former section. Cesarean section and sterilization.

B. (No. 5542), para v, aged twenty-five. Almost totally deaf. One forceps delivery, baby died; one version delivery, baby died; one induced premature labor, baby died; one low-flap cesarean section, baby lived. Justo minor pelvis. Cesarean section and sterilization.

R. (No. 1666), para ii, aged twenty-eight. Former cesarean section for marked polyhydramnios and small pelvis. Pregnant with twins, excessive polyhydramnios, complaint for several days of pain over old scar in uterus. Cesarean section and sterilization three weeks before term.

Z. (No. 2199), para ix, aged thirty-one. Eight full-term babies, only two survived. Others lost at deliveries by forceps, craniotomies, early induction, etc.

Unilaterally contracted pelvis due to short leg since ankylosis of knee in infancy. Vesicovaginal fistula seven years. Cesarean section and sterilization.

TOXEMIA

C. (No. 5486), para vi, aged twenty-eight. Four living children. History of toxemia in every pregnancy. Eclampsia in two labors. Blood pressure 170/110, 4+ albuminuria, not relieved by treatment. Cesarean section and sterilization.

T. (No. 2333), para vii, aged thirty-three. First pregnancy, miscarriage at six months; second pregnancy, miscarriage at three months; third pregnancy, born at eight months; fourth pregnancy, living; fifth pregnancy, induction at eight months, baby died; sixth pregnancy, induction at seven months, baby died. Toxemia in all pregnancies. Hysterotomy and sterilization.

M. (No. 4317), para v, aged forty. Headache, edema, 4+ albumin, casts, nausea, epigastric pain, nervous, defective vision. Symptoms improved temporarily under treatment, then grew worse in spite of treatment. Blood pressure 220/120. Cesarean section and sterilization.

F. (No. 5579), para iii, aged thirty-five. Serious toxemia, blood pressure 202/120. Similar symptoms in last pregnancy. Cesarean section and sterilization.

NEPHRITIS AND TOXEMIA

G. (No. 5631), para vii, aged thirty-six. Six living children. Former severe toxemia. Now nephritic toxemia not relieved by treatment. Cesarean section and sterilization.

S. (No. 1960), para i, aged twenty-four. Nephritis for several years. Eclampsia, 4 convulsions. Hysterotomy and sterilization.

H. (No. 3702), para viii, aged thirty-five. Former nephritic toxemia. Seven living children. Acute nephritis at fourth month for which treatment failed. Hysterotomy and sterilization.

NEPHRECTOMY AND NEPHRITIS

C. (No. 5561), para v, aged thirty-seven. Three living children. One kidney out and the other infected. Phenolsulphonephthalein test 35. Albumin and pus in urine, specific gravity 1002. Toxic symptoms. Hysterotomy and sterilization.

C. (No. 20290), para ii, aged twenty-four. Former nephrectomy. Former cesarean section for toxemia and long labor. One living child. Albuminuria, elevated blood pressure. Cesarean section and sterilization.

TUBERCULOSIS

L. (No. 3935), para viii, aged thirty-five. Seven living children. Active tuberculosis clinically and by laboratory and x-ray diagnosis. Hysterotomy and sterilization.

S. (No. 7107), para iii, aged twenty-six. Three months' pregnancy. Two living children, active tuberculosis for eighteen months growing rapidly worse since pregnancy. Hysterotomy and sterilization. Spinal anesthesia.

R. (No. 3151), para iv, aged thirty-one. Tuberculosis before marriage. Three living children. Each pregnancy including the fourth and last was accompanied by severe nausea and vomiting, and loss of weight and exacerbation of pulmonary lesions. Hysterotomy and sterilization.

CARDIAC

B. (No. 24509), para vi, aged thirty-one. Mitral stenosis, hypertension, not improved by treatment. Hysterotomy and sterilization.

F. (No. 4591), para vii, aged thirty-five. Five living children. Double mitral lesion, broken compensation. Last two pregnancies developed broken compensation. Elective section and sterilization.

B. (No. 54), para vi. Double mitral broken compensation at fifth month. Treatment failed. Hysterotomy and sterilization.

POSTENCEPHALITIS

F. (No. 18), para i, aged nineteen. Severe postencephalitic syndrome not relieved by treatment. Hysterotomy and sterilization.

B. (No. 4120), para iii, aged twenty-four. Postencephalitic syndrome and paralysis. One miscarriage at three months, one miscarriage at two months. Hysterotomy and sterilization.

MISCELLANEOUS

W. (No. 3011), para vi, aged thirty-five. Four children living. Albuminuria. Operated two years ago for spinal tumor leaving both legs in spastic contracture. Subsequent attempts of surgery failed to relieve contracture. Thighs flexed firmly on abdomen; and calves flexed firmly on thighs. Could not stand or walk. Could not sit except with feet supported on high stool. Cesarean section and sterilization.

S. (No. 3338), para ii, aged twenty-eight. Former cesarean section followed by large keloid of abdominal wall. Keloid later resected and recurred. Cesarean section and sterilization.

A. (No. 3932), para v, aged thirty-two. Last labor, face presentation, ruptured uterus and vaginal vault, delivery completed below and rupture packed. No repair done. Much discomfort and uterine pain after seventh month in this pregnancy. Cesarean section and sterilization.

H. (No. 5819), para iv, aged twenty-six. First pregnancy, hydatid mole; second pregnancy, pernicious vomiting, twins; third pregnancy pernicious vomiting, mental breakdown. Therapeutic abortion seriously advised by psychiatrist, carried through later, trachelorrhaphy, sterilization, appendectomy, plication of round ligaments.

V. (No. 5966), para iii, aged twenty-eight. First pregnancy, general poor health and confined to bed much of time. Never robust as a girl. Second pregnancy, miscarriage second month. Third pregnancy, much general debility, serious nausea and vomiting. Trachelorrhaphy, Gilliam suspension and sterilization.

B. (No. 6982), para iv, aged twenty-nine. Four full-term labors in five years; badly lacerated cervix, retroversion, general ill health. Economically in bad condition. Trachelorrhaphy, plication of round ligaments, sterilization.

W. (No. 6637), aged twenty-one. Congenital cataract. Two children congenital cataracts. Husband also blind. Sterilization in puerperium.

M. (No. 6724), para iv, aged thirty. First baby weighed $8\frac{1}{2}$ pounds, spontaneous delivery. Second baby weighed $9\frac{1}{2}$ pounds, spontaneous delivery. Third after long labor, cesarean section, 12-pound baby. Now pregnant at term. Cesarean and sterilization.

There were no deaths except one encephalitis syndrome patient who was considered practically moribund before operation, died of exhaustion and myocardial failure.

As to sterilization in toxemia of pregnancy, much individualization is necessary. In the recurrent type of toxemia with definite renal involvement, there is little doubt as to the indications to sterilize. Certain other types of toxemia may recover sufficiently to be allowed to risk subsequent pregnancy.

In a definitely established nephritis one may be quite sure that subsequent pregnancy is too dangerous to be risked and sterilization is strongly indicated.

As to the rule to follow in sterilizing cases of contracted pelves, there remains much difference of opinion. Few authorities are willing to sterilize in this condition at the first section, some believe that a second or third section is all any woman should be compelled to undergo. Most obstetricians are now sterilizing at the third or fourth section depending somewhat upon whether the former children are living. There can of course be no justification in hysterotomy prior to viability of the child where the only indication is contracted pelvis.

In cardiac cases it is very difficult if not quite impossible to formulate rules regarding sterilization. Each case must be studied thoroughly by a competent cardiologist, the type of lesion determined and the degree of decompensation carefully analyzed before a decision can be properly reached.

Encephalitis syndrome, chorea, epilepsy and other conditions mentioned in these case histories require special study in each case.

As to sociologic and economic reasons for sterilization or hysterotomy one is much handicapped by public opinion. Schumann³ states that 80 to 85 per cent of all criminal abortions are among married women and suggests that some satisfactory method of birth control might markedly reduce the number of illegal abortions.

Rongy⁴ believes we are not giving sufficient attention to the fact that many married women who already have large families, are living in a constant dread and fear of pregnancy with a result that they sometimes develop altered psychic reactions toward their husbands and children.

The physician has not the single duty of administering to present ills, but the far-reaching duty of adding to the full extent of his ability to the patient's future health and happiness and also to the health and happiness of other members of the family.

With a careful and conscientious selection of his patients, the obstetrician of today is in a position to do many more hysterotomies and sterilizations than have been done in the past.

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POSTPARTUM PARTIAL ANURIA WITH UREMIA AND FATAL UPPER ABDOMINAL HEMORRHAGE; REPORT OF A CASE WITH AUTOPSY FINDINGS

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(From the Obstetrical and Gynecological Service, University of Virginia Hospital)

THE patient, Mrs. C. S., para viii, aged thirty-eight, was admitted to the University Hospital, Sept. 14, 1930, eight and one-half months advanced in her eighth pregnancy, complaining of painless vaginal bleeding. Her out-patient prenatal record was distinctly normal. Past history was unimportant and previous pregnancies uncomplicated.

Vaginal examination revealed a placenta previa lateralis, the cervix being dilated about one and one-half fingers. Good pains were beginning. Presentation was



Fig. 1.—Kidney of the large, white, pale variety with cortex and pelvis normal.

L.O.A. General physical examination was negative. Blood pressure 130/70; uranalysis normal; hemoglobin 65 per cent; R.B.C. 3.7; Wassermann negative.

A spontaneous labor of about two hours resulted in normal delivery of healthy female baby. Total blood loss was estimated at 400 c.c. An indirect blood transfusion of 750 c.c. from an ideal donor was given immediately postpartum. Five hours later patient showed signs of moderate obstetric shock. The blood pressure, uranalyses, blood urea, blood creatinine, fluid intake, and urinary output are graphically represented in Fig. 3.

First Day: General condition was quite satisfactory except for blood pressure, 100/50, for which 700 c.c. of citrated blood from an ideal donor was given. A very slight jaundice was observed.

Second Day: The jaundice was marked. Marked decrease in urinary output occurred. Uranalysis was strongly positive for bile. Icteric index 42; van den Bergh, direct and indirect, strongly positive; hemoglobin 70 per cent; R.B.C. 4.0.

Third Day: Jaundice was less. Slight pitting edema of ankles and about the sacrum appeared. Respiration was depressed and slowed. Increasing urinary suppression was manifested. W.B.C. were 22,000.

Fourth Day: Condition was not improved, except for decrease of jaundice. There was mental sluggishness. Edema had not increased. Cystoscopic examination with ureteral catheterization revealed bilateral anuria.

Fifth Day: Patient showed poor orientation with sluggish responses. Clinical jaundice was not apparent. Blood cholesterol 121 mg.; blood nonprotein nitrogen 129 mg.; blood uric acid 21 mg.; blood diazo reaction, negative; icteric index 21; plasma CO₂ 37 vol. per cent; hemoglobin 45 per cent; R.B.C. 3.25; W.B.C. 11,000; fragility test normal.

Sixth Day: Patient's mental picture had improved. Slight vomiting occurred during the morning. Respiration was of Kussmaul type. Eye grounds were normal. Patient voided frequently in small amounts. Blood sugar 67 mg.; plasma CO₂ 30 vol. per cent.; blood calcium time 1¾ min.; bleeding time 6 min.; clotting time 2½ min.

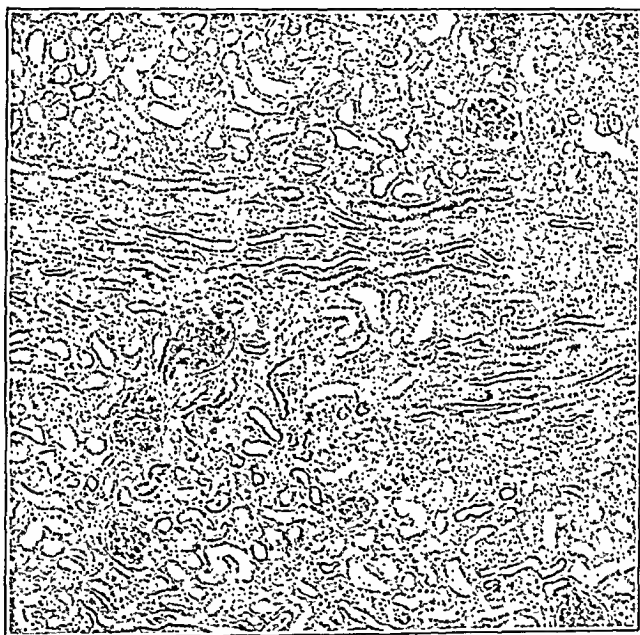


Fig. 2.—Microphotograph of kidney, showing marked tubular degeneration, a moderate increase in fibrous elements, and fatty degeneration of several of the glomeruli. Some of the tubules are filled with blood.

Seventh Day: Patient became drowsy and difficult to arouse in afternoon with recurrence of Kussmaul respiration. Edema was moderately increased. Blood sugar 83 mg.; CO₂ plasma 30 vol. per cent; blood indican 3½ mg.; blood chlorides 380 mg.; methemoglobin (spectroscopic test) negative; sedimentation velocity normal.

Eighth Day: Patient was still irrational. There was demonstrable ascites with marked puffiness of face and beginning hiccoughs. Anuria for over twelve hours was followed by output of 700 c.c. during remainder of the day. Blood sugar 72 mg.; plasma CO₂ 29 vol. per cent; hemoglobin 45 per cent; R.B.C. 3,250,000; W.B.C. 32,000; urine urea 1.008 gm.; urine ammonia 1.239 gm.

Ninth Day: Marked coma of acidosis developed in early morning with respiration of six per minute and CO₂ plasma 29 vol. per cent. Five hundred c.c. of 5 per cent sodium bicarbonate given intravenously, during the administration of which there was a slight generalized clonic convulsion. Condition soon improved. Temper-

ature, elevated for the first time, reached a maximum of 101° . Hemoglobin 45 per cent; R.B.C. 2.5; W.B.C. 28,000; blood sugar 91 mg.; CO_2 plasma 47 vol. per cent; urine urea 6.73 gm.; urine ammonia 4.6 gm.

Tenth Day: Condition was definitely improved with return of mental alertness. Temperature 100.2° . Edema had decreased slightly. Blood sugar 111 mg.; CO_2 plasma 40 vol. per cent; urine urea 9.85 gm.; urine ammonia 1.51 gm.; blood diazo negative.

Eleventh Day: Further improvement was apparent. There were delusions of persecution and disorientation. Temperature 100.4° ; blood sugar 110 mg.; CO_2 plasma 39 vol. per cent; urine urea 10.3 gm.; urine ammonia 1.18 gm.

Twelfth Day: General condition apparently unchanged, except that there was a complaint of lower abdominal cramps. Urinary output was showing gradual

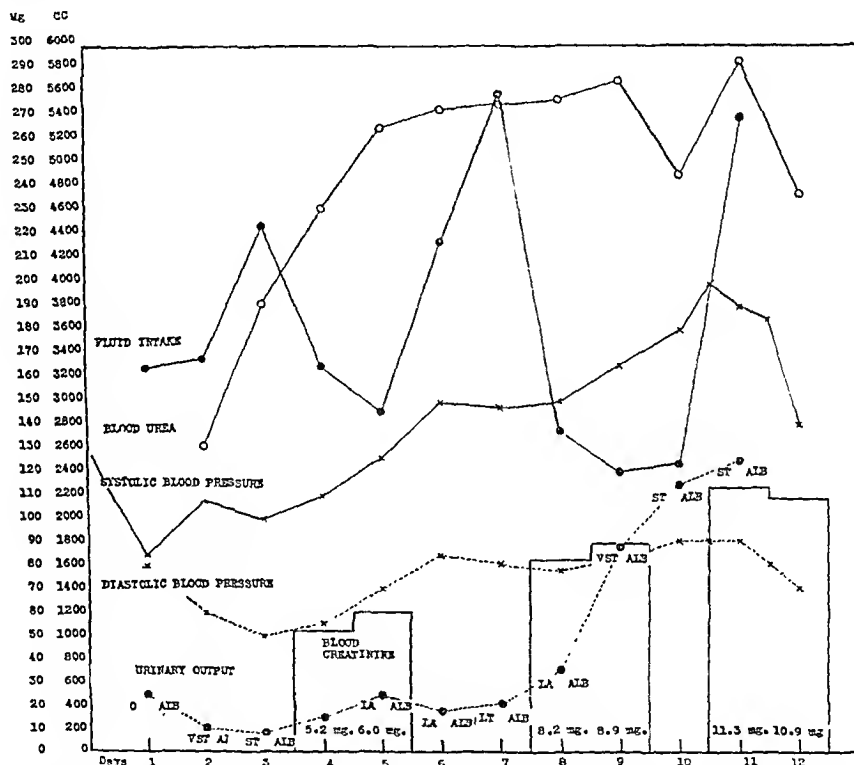


Fig. 3.—Chart showing fluid intake and urinary output in c.c.; blood urea and blood creatinine in mg. per 100 c.c.; and systolic and diastolic blood pressure. Albuminuria is indicated on the urinary graph as "VST alb," "LA alb," etc.

increase. At 10 A.M. patient suddenly became unconscious and exhibited marked pallor and cyanosis, pulse of very poor quality, respiration slow and difficult. Stimulation was administered without success and death from simultaneous respiratory and cardiac failure occurred in twenty minutes. Laboratory findings (taken one hour before death): blood urea 238 mg.; blood sugar 116 mg.; CO_2 plasma 43 vol. per cent; icteric index 6.4; blood creatinine 10.9 mg.

Treatment was supportive and symptomatic and included: Karrell diet for first three days with additional fluids to approximately 4500 c.c. Fruit juices were substituted for the milk after the third day. Intravenous hypertonic glucose was given once or twice daily. Hot stupes to kidney region and hot high colonic irrigations were administered. Renal decapsulation was advised against by the urologic consultants. No diuretics, except hypertonic glucose and twenty grains of theocin.

Autopsy Findings: The abdominal cavity contained about 2000 c.c. of blood-tinged fluid. Peritoneum was normal. Blood and clots, estimated to be 1000 c.c., were found in the upper abdomen, about the greater curvature of the stomach, medial surface of the spleen, surrounding the upper portion of the pancreas and in the lesser omental cavity. No site of hemorrhage could be located.

Liver: Surface was pale. Microscopic sections showed granular and fatty degeneration, most marked about the central veins. Liver cords in some fields were atrophic and cells showed unusually large nuclei. *Parenchymatous degeneration of liver.*

Kidneys: Tissue was pale, white, and with cortex and pelves normal. There were several areas of hemorrhage into the lining membrane. Microscopic studies showed very marked tubular degeneration, a moderate increase in new fibrous tissue stroma of marked edematous character, and a fatty degeneration of the glomeruli. A number of tubules were filled with blood. *Subacute and chronic diffuse nephritis.* (See gross and microphotographs.)

Uterus: Subinvolution with site of attachment of placenta previa lateralis.

Chemical examination: Examination of the organs revealed absence of heavy metals.

COMMENTS

This case presented interesting problems from several angles. (1) The prenatal records showed no evidence of demonstrable renal impairment. (2) The two large blood transfusions which the patient received were indicated by the secondary anemia and obstetric shock. (3) The jaundice was probably related to the transfusions as it was apparently hemolytic in type. (4) It is quite difficult to explain the renal suppression. One must consider the possibility of reflex kidney spasm, perhaps, related to the blood transfusions. (5) The acidosis in spite of intravenous glucose and an apparent capable sugar metabolism was rather unexpected. (6) The increasing secondary anemia indicated another blood transfusion, but the possible etiologic rôle of transfusions caused us to refrain. (7) The prognosis during the last five days was very poor in spite of the increased urinary output, as the blood urea and creatinine were still increasing and the quantitative determinations on the urinary nitrogenous constituents showed the increased secretion to be only of the fluid elements. (8) The upper abdominal hemorrhage is probably explainable by a massive diapedesis.

CYSTIC FIBROID WITH TWISTED PEDICLE, SIMULATING AN OVARIAN CYST

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THE chief interest of this type of uterine tumor lies in the difficulty of a correct clinical diagnosis, because of close resemblance of the physical findings to an ovarian cyst. Although our specimen by its size and weight occupies a very modest place among the host of others, it has the distinguishing feature of possessing a twisted pedicle, a fact which makes the clinical picture still more confusing and the similarity to an ovarian cyst with the same complication, still more striking.



Fig. 1.—The thinnest portion of the sac, 1 mm. thick, with both margins are devoid of epithelium, $\times 240$. (a) Outer surface of the sac, (b) inner surface of the sac, (c) area of hyaline degeneration.

Because of the fact that this type of tumor is not sufficiently dwelt upon in the textbooks of gynecology and even in gynecologic monographs and the condition is often not recognized, we believe its presentation might be of some interest.

The specimen was obtained from an autopsy of an unmarried white woman of sixty-nine at the Lutheran Deaconess Hospital of Chicago.

The patient was admitted to the hospital with complaints of swelling of her legs and general weakness. The patient stated that most of her troubles began about two months prior to the admission to the hospital. General weakness grew gradually worse; dyspnea, edema of the legs, gastric disturbances, constipation, pain in the cardiac region and over the left shoulder, frequency of urination, loss of weight were the symptoms that developed in the next two months. The past history was of no importance. Menopause occurred twenty years ago. There were no gynecologic complaints. Upon physical examination the abdomen was found enlarged and

signs of free fluid could be elicited; the lower extremities were edematous, action of heart irregular (auricular fibrillation); blood pressure S. 230, D. 140 mm. Hg. Repeated uranalysis revealed trace of albumin and no other abnormalities. Blood count showed a moderate leucocytosis of 11,300 with a practically normal differential count.

The symptoms progressed unfavorably and the patient died with signs of uremia, February 22, 1930, after three and one-half weeks' stay in the hospital.

At the autopsy there was found a generalized arteriosclerosis and especially of the coronary arteries; hypertrophy of the myocardium; arteriosclerotic kidneys. The abdomen contained about a liter of clear serous fluid and a large cystic tumor that arose from the uterus.

The cystic mass was attached to the posterior surface of the corpus uteri by a pedicle twisted about its long axis to 180 degrees and measuring $4 \times 3\frac{1}{2} \times \frac{1}{2}$ cm. (after formalin fixation). The base of the tumor was solid but the major portion

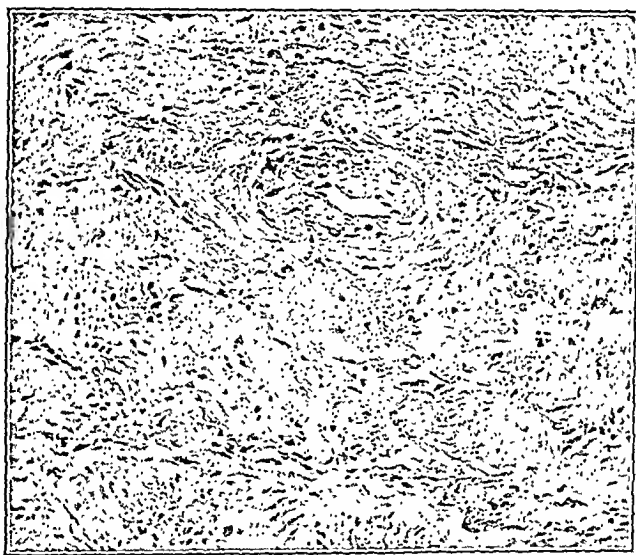


Fig. 2.—Section from the solid portion of the tumor, showing myomatous tissue interspersed with fibrous stroma, and small areas of hyalinization. Occasionally edema is seen. $\times 240$.

was thinned out into a sac. The sac in its fresh state measured 25 cm. in diameter and was filled with clear straw-colored fluid. The solid portion of the tumor was ovoid and measured $9 \times 8 \times 3$ cm. (after formalin fixation). The outer surface of the sac was of grayish pale color, smooth and glistening. The inner surface was uneven, trabeculated and had several small compartments. The thickness of the sac varied from 1 to 10 mm. and in many areas it was transparent.

Both ovaries were atrophied. The fallopian tubes did not deviate from normalcy. The body of the uterus contains several other small fibroids, one of which at the lower end of the corpus was 3 cm. in diameter, hard as a stone and did not yield to the knife. The endometrium was smooth, atrophic and the uterine cavity distorted but small.

Histologically, the solid part of the tumor and the cystic sac consisted of a fibromuscular structure with slight predominance of fibrous tissue, which formed bright red bands in the van Gieson Stain. Many areas of hyaline degeneration were seen here and there within the substance of the myomatous tissue. The inner

surface of the sac did not reveal any epithelial lining. The thinner the wall of the cyst, the more fibrous tissue appeared under the microscope. The small fibroids revealed a considerable amount of myomatous tissue and a fibrous stroma.

It is quite possible that the fibrocysts are not as common as indicated because under this title have been included uterine cysts lined with epithelium. True fibrocysts have no epithelial lining and the earlier authors did not furnish evidences that their specimens were devoid of an epithelial lining inasmuch as no histologic studies were reported.

The frequency of such tumors, their pathology and clinical importance will be considered further. The fibrocysts are derived from solid fibromyomas, but the process by which the cystic transformation occurs is not quite clear. Some authors regard a previous fatty degeneration as the cause of the cyst formation, because in some cases



Fig. 3.—The gross appearance of the tumor and uterus with adnexa. (a) Calcified small fibroid at the corpus uteri, (b and c) both adnexa. (d) uterine cavity, (e) the solid portion of the tumor, (f) the cystic sac, folded upon itself.

the cystic contents contained crystals of cholesterol; others as Kelly, for instance, consider hyaline degeneration an important factor in this process; there are some who attribute the cavity formation to a previous hemorrhage into the substance of a solid fibroid, which by gradual enlargement further distends the original small cavity into a large cystic space; still others believe that distention of the lymph vessels is the cause of the cyst formation.

Like the solid fibroids, the fibrocysts occur most often during the period of sexual activity of women, more frequently in married and parous women, although aged, nulliparous, and virgins are not spared. We have a better knowledge of the pathology of such tumors than of their etiology.

Cystic fibroids of the uterus are classified according to their site of origin, as subserous, intramural or interstitial and submucous. The fibrocysts have usually a pedicle, more or less broad, and most fre-

quently they arise from the posterior wall of corpus uteri, although almost any other possible area of this organ has been described as the site of origin in isolated cases. The cystic portion represents a sac of various thickness; the inner surface is uneven, in many instances there are small cystic cavities, communicating with each other. The size varies from that of a walnut to enormous dimensions, surpassing several times a uterus at term. In some instances they acquire almost fabulous dimensions, as in the case of Severanu, in which case the tumor weighed 195 pounds (quoted from Webster), of Hunter, 140 pounds, of Stockard, 135 pounds, of Ulyanowsky, 88 Russian pounds, of Kelly, 89 pounds, of Webster, 78 pounds, Theile, 81 pounds. As a rule there are numerous adhesions to the abdominal viscera, much more frequently than the ovarian cysts for which they are often mistaken. When the nutrition of the pedicle is impaired, necrosis may occur and the tumor becomes free and is classified as "parasitic" or "wandering." When the base of the fibrocyst is broad and intimately connected with the uterine wall, the latter organ is often found hypertrophied, its cavity elongated and distorted. In a few instances the cysts become inflamed and their contents purulent. In the case of Routh (quoted from Heer) pure pus was found in the cystic cavity. In recent literature a similar case was reported by Mignon.

The contents are usually straw colored but may be brownish or red from admixture of blood and in the majority of cases coagulate on exposure to air. The fluid of an ovarian cyst as a rule does not coagulate.

Histologically fibrocysts consist of muscle bundles with more or less admixture of fibrous tissue. There is no epithelial lining in the true fibrocysts. In many instances areas of hyaline degeneration and edema are described.

The symptomatology of the fibrocystic tumors resembles that of a solid fibroid and depends largely upon the size of the cyst and its relationship to the uterus. When the tumor has a broad base and is intimately connected with the substance of the myometrium, the disturbances of menstruation, such as irregular periods, too frequent and prolonged menstruation, menorrhagia, and dysmenorrhea are frequently produced.

These tumors after a long period of quiescence begin to grow rapidly and within a comparatively short period of time may acquire colossal size and thereby cause distinct signs of pressure, such as dyspnea, palpitation of the heart (due to the raised diaphragm) hydrothorax, varicosities, and cyanosis of the lower extremities.

The submucous fibrocysts may excite attacks of labor-like contractions of the uterus, due to the efforts of this organ to expel its contents. A case like that was described by Gusserow. In a few cases, the patients complained of increase in size of the abdomen during the

menstrual periods. Heer mentions this phenomenon in his excellent monograph on fibrocyts, and Kelly and Cullen in their *Fibromyomata of the Uterus*. Spontaneous rupture of a fibrocyt is very rare, but is described in a case by Zeller and Anderson, and by Beatty (both cases cited from Heer's monograph). A number of authors observed a uterine souffle (bruit), which is due to the presence of large blood vessels. Dystocia in cases of pregnancy has been described quite often, the severity of which depended upon the size of the tumor and its relation to the birth canal, as in any other large pelvic tumor.

The diagnosis of these tumors is quite complicated, as it has been said before, the chief difficulty lies in mistaking them for ovarian cysts. The resemblance on physical examination is remarkable indeed. If one takes into consideration the fact that although the tumor in question feels like an ovarian cyst, the clinical behavior resembles a fibroid to a great extent in causing menorrhagia, metrorrhagia, irregularity and enlargement of the uterine cavity. The peculiar course of the fibrocytic tumor, namely, the rapid growth after a long period of quiescence may be helpful in arriving at a correct diagnosis. It should be remembered that an ovarian cyst gives a feeling of elasticity, and fluctuation; the sac feels more or less smooth, while the fibrocytic tumor besides having a fluctuating area, gives also the impression of a firm, even hard mass, with uneven contours, a mass which bears resemblance to a fibroid. This combination of signs of both fibroid and cyst is characteristic of a fibrocytic tumor.

The coagulation of the cystic contents upon exposure to air has been considered a pathognomonic sign of a fibrocyt, but has no practical value. The procedure of aspirating the cyst is not to be recommended, because of possible infection. Caution in this regard deprives us of another sign, namely, in the case of an ovarian cyst (not dermoid though) the withdrawal of fluid leaves the sac soft and collapsible, whereas a hard mass of various size is the result of an aspirated cystic fibroid.

The cystic fibroid may be quiescent for some time or when left alone, they may acquire considerable size and impair to a great extent the health of the patient. There were fatal outcomes in patients not operated upon because of disturbed circulation, breathing, and even cachexia. A removal of the tumor gives a good prognosis; the great mortality of the early authors was due to error in their technique. Poor hemostasis and aspiration of the cystic contents caused an appalling mortality in early days of surgery. At the present time operative interference is not only feasible but strongly advisable as soon as the rapid growth of the cyst is observed.

A few cases, which illustrate the pathology most clearly will be quoted briefly. Kelly and Cullen described a patient who suffered from considerable intraabdominal pressure. Dyspnea was so marked that it was necessary to perform the operation

in a semisitting posture of the patient. The abdominal incision measured almost 4 feet and the cystic tumor upon removal weighed 89 pounds. In another patient of the same authors the fibrocyst weighed 39 pounds. The interesting feature was the increase of the girth of the patient during menstrual periods. Histologically, the solid and cystic parts of the tumors showed myomatous tissue with areas of hyalinization. No epithelial lining was found in the sac.

Stone's case is worthy of mention, because the tumor became "wandering" or "parasitic." A woman of fifty-five years, single, had a tumor for years which was diagnosed as ovarian cyst. The operation revealed a cystic tumor lying practically free in the abdominal cavity. The only attachment was found near the right parovarium. The author assumes that possibly a narrow pedicle became twisted; the tumor sloughed off, to become a free mass in the abdominal cavity.

We may add here that there are very few cases of fibrocysts with torsion of pedicle reported. We know of Kelly's case and Stone's parasitic tumor (probably). Our own specimen revealed this feature very distinctly.

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Jones, W. J., and Bunting, C. H.: Invasion of the Fallopian Tube by Oxyuris Vermicularis. Arch. Path. 11: 229, 1931.

A case is reported of a girl aged twenty-two operated upon for appendicitis. A typically inflamed appendix was removed through a right rectus incision. On further abdominal exploration, the left tube and ovary were found adherent and much enlarged. A left tubo-oophorectomy was also done, the patient making an uneventful recovery. Gross section of the appendix revealed numerous oxyuris ova. The left fallopian tube showed a marked purulent salpingitis. Histologic examination of the tube showed a female oxyuris in its wall, the parasite being heavily laden with ova. The area containing the parasite was surrounded by a necrotic zone and numerous eosinophiles but no mononuclear phagocytes were found.

The authors call attention to the fact that oxyuris ova are commonly found in the lumen of the appendix; when found in the wall of the appendix, a true appendicitis may occur. As for the association of the two lesions, it may be recalled that at night there is noticed a marked perineal itching at which time the female parasite wanders across from the anus to the vagina, enters the latter organ and begins its upward wandering into the internal genital tract. The authors found only two other authenticated cases of invasion of the wall of the tube by oxyuris.

W. B. SERBIN.

A COMPARATIVE STUDY OF THE ASCHHEIM-ZONDEK AND MAZER-HOFFMAN TESTS FOR EARLY PREGNANCY*

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THE importance of determining the existence of the gravid state, together with the varying conditions from which it must be differentiated, have been repeatedly emphasized in the past few years. With the recent advent of the hormone tests for early pregnancy, a great deal of confusion, which hitherto confronted even the most skilled obstetrician, is today being clarified in the laboratory.

Since June, 1930, we have maintained a "Pregnancy Station" for the laboratory diagnosis of pregnancy. Thus far we have chiefly employed two recognized biologic tests, the anterior pituitary hormone test of Aschheim and Zondek, and the female sex hormone or estrin test of Mazer and Hoffman. During this period we have made an investigation of these tests, with the view of ascertaining first, the comparative degree of accuracy of each, when carried out independently and second, the relative value of both tests, considered as one.

The present report is based upon a study of 248 patients, of whom 35 were controls, in whom the diagnosis was definitely known, 200 were problem cases, and 13 involved the question of life or death of the ovum. Many of the urine specimens were sent in by outside physicians, so that it was not always possible to secure a fresh morning specimen so essential for the test. Only those patients who were followed up, and in whom an accurate report, as to the outcome was obtained, are considered in this communication.

It is well known that estrin or female sex hormone does not appear in demonstrable quantity in the blood during pregnancy until eight weeks after fertilization. During this same period, however, demonstrable quantities of this hormone are found in the urine in sufficient amount to be used as a guide for the diagnosis of early pregnancy. In explanation of this apparent discrepancy, Mazer advances the theory that, since the corpus luteum hormone prepares the endometrium for the proper nidation of the developing ovum, its presence in the blood is most essential in the early period of gestation. Female sex hormone, on the other hand, governs growth and vascularization of the uterus, which is less essential at this early stage. This hormone is, in a sense, the antithesis of the lutein hormone, in that it may even produce abortion in the pregnant rat and guinea pig. The elimina-

*Read before the Obstetrical Society of Philadelphia, March 5, 1931.

tion of large quantities of female sex hormone in the urine, in the early part of pregnancy, is nature's attempt, therefore, to maintain a physiologic balance between these two hormones.

Aschheim and Zondek in discrediting this test, argue that the amount of estrin or female sex hormone in the urine is insufficient in the early part of gestation. This is true only if 2.5 c.c. of urine are used, as in the anterior pituitary hormone test. The employment of 12 c.c. of urine, however, which the size of the adult animal permits, eliminates this objection. They further maintain, that they have observed women with amenorrhea, who, although not pregnant, excrete large amounts of ovarian hormone in the urine (hyperhormonal amenorrhea). It must be borne in mind, however, that the demonstrable quantity of hormone, as reported by these investigators and by Frank and others, is found in 250 c.c. of urine, in women suffering from amenorrhea and functional sterility, as compared with only 12 c.c. of urine required for the pregnancy test.

ANALYSIS OF RESULTS

Table I illustrates the results obtained among the 35 control cases. Twenty-five patients were pregnant and 10 were not pregnant. The results were uniformly correct in all instances, according to both the Aschheim-Zondek and the Mazer-Hoffman tests.

TABLE I. POSITIVE CONTROL CASES, TWENTY-FIVE ALL CORRECT POSITIVES

NO. OF PATIENTS	APPROXIMATE STAGE OF PREGNANCY
4	three months
6	four months
6	five months
7	six months
2	seven months
—	
Total 25	

Negative control cases, 10, patients who suffered with various gynecologic disorders. All correct negatives.

TABLE II

PREGNANT PATIENTS	NO. OF PATIENTS
Obesity with amenorrhea	14
One to three weeks after first missed period	42
Fibroid complicating pregnancy	7
Ectopic pregnancy	4
Uterine bleeding during early pregnancy	4
Amenorrhea with tuberculosis	5
Lactation amenorrhea	8
Ovarian cyst with pregnancy	3
Psychosis with amenorrhea	3
Unmarried	5
Sterility 15 yr. with diabetes	1
Sterility 9 yr.	1
—	
Total	97

Tables II and III depict the various conditions encountered among 200 pregnant and nonpregnant women. Only cases involving problems in diagnosis are considered in these two groups. This accounts for the somewhat smaller degree of accuracy than reported by other investigators.

TABLE III

NON-PREGNANT PATIENTS	NO. OF PATIENTS
Delayed period	24
Oligomenorrhea	12
Endocrine disturbance with obesity	17
Pseudocyesis	4
Amenorrhea with tuberculosis	6
Lactation amenorrhea	6
Amenorrhea after radium	1
Amenorrhea two to six months	10
Severe anemia	8
Acute salpingitis with bleeding	2
Graves' disease	2
Missed period after shock	4
Menopause	7
Total	103

TABLE IV.—NINETY-SEVEN PREGNANT PATIENTS, PROBLEM CASES ONLY

	CORRECT POSITIVE	INCORRECT NEGATIVE
Aschheim-Zondek test	80 (82.4%)	17 (17.6%)
Mazer-Hoffman test	74 (76.3%)	23 (23.7%)

ONE HUNDRED AND THREE NONPREGNANT PATIENTS, PROBLEM CASES ONLY

	CORRECT NEGATIVE	FALSE POSITIVE
Aschheim-Zondek test	96 (93.2%)	7 (6.8%)
Mazer-Hoffman test	103 (100.0%)	0 (0 %)

In Table IV, it is noted that among the 97 pregnant patients, 17 results were incorrectly negative by the Aschheim-Zondek test, and 23 by the Mazer-Hoffman test. This is a rather large percentage of error, and indicates that with a single negative result by either test, one cannot be certain of the absence of pregnancy.

We feel, however, that when one analyzes the group of the nonpregnant patients, Table V, the possibility of an incorrect positive result is of much more serious significance and importance.

In the group of 103 nonpregnant women, there were obtained 7 wrongly positive reactions by the Aschheim-Zondek test; whereas there were no false positive results with the Mazer-Hoffman tests.

Mazer and Hoffman, in a study of 164 nonpregnant women, obtained a false positive Aschheim-Zondek reaction in 16 (10 per cent). In the light of our recent knowledge of the physiology of the anterior pituitary gland, it is not difficult to explain this large percentage of false positives.

TABLE V

ASCHHEIM-ZONDEK	MAZER-HOFFMAN	CLINICAL FEATURES AND FOLLOW-UP	
(1)	Neg. Neg.	Neg. Neg.	Three months pregnant. Had stillbirth following day.
(2)	Pos.	Neg.	Bled profusely. Two months pregnant. Later had D. & E. for dead ovum.
(3)	(a) Neg. (b) Pos.	Pos. Pos.	Two months' pregnancy. Severe nausea. Occasional uterine bleeding. Patient carried to term.
(4)	(a) Neg. (b) Pos.	Pos. Pos.	Apparent cessation of uterine growth. Patient carried to term.
(5)	(a) Neg. (b) Neg.	Neg. Neg.	Three months' pregnancy. Intrauterine fetal death. D. & E. later performed.
(6)	(a) Pos. (b) Pos. (c) Neg.	Neg. Neg. Neg.	Enlargement of uterus, but patient bled each month. Patient later miscarried.
(7)	Pos.	Pos.	Two months' pregnancy. Profuse bleeding after taking emmenagogues. Patient carried to term.
(8)	(a) Neg. (b) Neg. (c) Pos.	Neg. Neg. Pos.	Two months' pregnancy with bleeding. No dilatation of cervix. Bleeding continued for two weeks. Then both tests became strongly positive and bleeding ceased; patient going to term.
(9)	Pos.	Neg.	Patient aborted at four months.
(10)	Pos.	Neg.	Pregnancy of two months with bleeding. D. & E. performed for dead ovum.
(11)	Neg.	Neg.	Continuous bleeding after two weeks of amenorrhea. Patient probably had an abortion.
(12)	Neg.	Neg.	Six months' pregnancy. No fetal movements. Dead baby delivered.
(13)	Neg.	Pos.	Amenorrhea of six months. Uterus enlarged in size the first two months; when all symptoms disappeared. Missed abortion. Four months later patient bled profusely. Had D. & E. performed for small dead ovum. (Persistent corpus luteum?)

Fluhmann has shown that normal fertile women, and those suffering from hypofunction of the anterior hypophysis, rarely, if ever have a demonstrable quantity of anterior pituitary hormone in the blood, except during pregnancy.

According to Rowe and Lawrence, primary anterior pituitary hypofunction is nearly five times more frequent than either primary ovarian or thyroid hypofunction.

Fluhmann, however, found a demonstrable quantity of anterior pituitary sex hormone in the blood of castrated women, and in those in whom the natural menopause was well established.

Pituitary hypertrophy following castration in the human being, was previously noted by Tandler and Grosz, evidently in an attempt to stimulate a poorly functioning ovary. Experimentally, Evans and Simpson and Engle have shown that the hypophysis of gonadectomized animals, possesses an activity, five times greater than the normal animal.

In a group of 18 sterile women, suffering with amenorrhea, but without any evidence of pelvic disease, Mazer found that 8 or 44.4 per cent showed a demonstrable quantity of anterior pituitary hormone in the blood. In a study of 30 women, suffering with delayed or scanty menstruation, he found the hormone in the blood in 6 or 20 per cent. Among 13 women in the early menopause, 7 positive reactions for anterior pituitary hormone in the blood were obtained, due, perhaps, to the hypertrophic changes in the gland. It is easily conceivable that this abnormal excess of hormone in the blood might also appear in the urine, so that these women may yield a falsely positive Aschheim-Zondek test for pregnancy.

The 7 false positives noted, all occurred in endocrine types of cases, which considerably detracts from the reliability of the test.

When the Mazer-Hoffman test was simultaneously employed in the group of 103 nonpregnant women, however, no positive results were obtained. It is evident that the error which may occur in the anterior pituitary hormone tests is practically eliminated with the female sex hormone test.

Frank has shown that many patients who fail to menstruate, even over long periods of time, may have, at the most, only a regular blood cycle of female sex hormone at a subthreshold level. This is insufficient to render a false positive reaction.

One must bear in mind, however, the possibility of a condition of hyperfunction of the ovary, which might increase the amount of female sex hormone and render a false positive. Frank has reported cases in which a liberal mouse unit of female sex hormone was obtained from only 20 or 30 c.c. of blood taken three to five days before the expected period, instead of from the usual 40 c.c. required. In such cases, it may be argued, one might occasionally obtain a false positive test for pregnancy. Thus far, however, we have not observed such a reaction in any of our patients.

A comparative analysis of the two tests performed in a group of 13 problem cases, involving the possible death of the ovum, brings out several factors of interest.

In 4 patients (Cases 2, 6, 9, and 10), who gave a positive Aschheim-Zondek reaction and a negative Mazer-Hoffman test, a miscarriage (i.e., death of the ovum) later followed.

In 4 patients (Cases 1, 5, 11, and 12) both tests remained persistently negative. In each case, a dead ovum was subsequently expelled.

In Case 8, two negative tests, both Aschheim-Zondek and Mazer-Hoffman were followed by a positive reaction. Almost simultaneously, the uterine bleeding ceased, and the gestation continued.

A positive Mazer-Hoffman test or repeated negative tests, in questionable cases, thus seem to have much prognostic value. A sound physiologic explanation may be offered for the evident accuracy of this test.

The function of the corpus luteum in producing an endometrium sensitizing, ovulation inhibiting hormone, is today well established. It is also recognized as the chief source of estrin or female sex hormone in the early part of pregnancy, to be supplanted later by the placenta. Through the influence of the corpus luteum, the uterus is brought into a pregravid condition, in preparation for the reception of the fertilized ovum. During pregnancy, the corpus luteum inhibits follicular ripening, as well as the cyclic engorgement of the genitals, which might disturb the developing ovum. If fertilization fails to occur, however, or the fetus dies, regressive changes in the corpus luteum or placenta have either already occurred, or take place immediately thereafter. The source of supply of the female sex hormone is thus instantly severed, and the Mazer-Hoffman test for pregnancy, which depends upon the activity of this hormone, is rendered negative.

The withdrawal of the hormonal production of the anterior pituitary gland appears, however, to be more delayed after the fetus is no longer viable. Although the ovum may be dead, as long as living syncytial cells or trophoblastic elements are present in the walls of the uterus, they either produce anterior pituitary hormone themselves or continue to stimulate the anterior pituitary gland. This is the explanation for the positive Aschheim-Zondek reaction, after the expulsion of an hydatidiform mole. This may also explain the occurrence of a positive Aschheim-Zondek reaction and a negative Mazer-Hoffman test in four patients who eventually were proved to have an inevitable abortion.

CONCLUSIONS

1. The anterior pituitary hormone test of Aschheim and Zondek is a reliable laboratory adjuvant for the diagnosis of early pregnancy. In our hands it yielded 82.4 per cent correct positives and 93.2 per cent correct negatives. The finding of 6.8 per cent false positive results, detracts, somewhat, from its complete reliability. Especially is this error likely to be encountered in women who are functionally sterile, due to endocrine disturbances, or in women approaching the menopause. In these women, a compensatory hypertrophy of the anterior hypophysis may produce an excessive quantity of hormone, which, finding its way into the urine, will render an incorrect positive.

2. The female sex hormone test of Mazer-Hoffman yields a smaller percentage of correct positives (76.3 per cent) but is somewhat more reliable in the positive diagnosis of pregnancy, especially in patients suffering with functional disturbances. A smaller percentage of false

positives, among nonpregnant patients (none in our series), was observed, when this test was employed. This is probably due to the fact that hyperfunction of the ovaries, which would be necessary in order to produce an excess of female sex hormone in the urine, and render a false positive, is rarely, if ever, found in cases of endocrine dysfunction.

3. In those patients in whom there is a question of a dead fetus (missed abortion), the presence of a positive Aschheim-Zondek and a negative Mazer-Hoffman test, on repeated occasions, denotes that the fetus is probably dead. It appears that the female sex hormone disappears from the urine somewhat earlier than does the anterior pituitary hormone.

4. Repeated negative Mazer-Hoffman tests in pregnancy in those cases accompanied by slight bleeding, denotes an insufficient quantity of female sex hormone, and a threatened abortion. Only when the female sex hormone appears in demonstrable quantities in the urine, may one feel assured that the ovum has secured a firm location, and that the pregnancy may continue.

5. The larger percentage of correct positives with the Aschheim-Zondek test, and the smaller percentage of false positives with the Mazer-Hoffman test, suggests that both tests be simultaneously employed in every instance in order to yield the most accurate results.

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(For discussion, see page 135.)

Schmidt, G.: The Problem of Thromboses and Embolism at the Breslau Woman's Clinic During the Years 1920-1930. *Monatsschr. f. Geburtsh. u. Gynäk.* 87: 352, 1931.

At the Breslau Clinic from 1920 to 1930 among 6114 gynecologic operations there were 134 instances of thrombosis (2.19 per cent) and 26 fatal pulmonary emboli (0.42 per cent). Among 10,297 confinements including 973 premature labors and abortions there were 102 cases of thrombosis (0.98 per cent) and 6 fatal pulmonary emboli (0.05 per cent). The author rules out intravenous injections as a cause of thrombosis. On the other hand, important predisposing factors in the formation of thrombi are the constitution of the woman, the social position and the mode of living. In the postoperative deaths from pulmonary embolism the important factors were lowered resistance and poor general condition. A prophylactic measure against thrombosis is systematic exercising during the puerperium. The Trendelenburg operation was performed three times but without success.

J. P. GREENHILL.

OBSTETRIC ANESTHESIA AND ANALGESIA WITH SODIUM-ISO-AMYL-ETHYL-BARBITURATE AND NITROUS-OXIDE-OXYGEN*

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THIS clinical study of the effects during parturition of sodium-iso-amyl-ethyl-barbiturate, commonly called sodium amytal, was made on a series of 30 cases, part ward and part private, at the Hahnemann Hospital and the St. Luke's and Children's Homeopathic Hospital of Philadelphia. There were 21 primiparae and 9 multiparae of whom 4 were para ii, 4 were para iii, and 1 was a para x. The fact that more than two-thirds of the cases were primiparae makes the study a reasonably fair test for a small series of cases, since a primipara requires analgesia over a longer period of time to obtain pain relief.

ESTIMATION OF PREVIOUS AGENTS EMPLOYED

Prior to the agents employed, various preparations and methods were tried and discarded. The problem of the most suitable agent in obstetrics is a complicated one, and greatly dissimilar to anesthesia for general surgery. In obstetrics the pain is more prolonged, yet intermittent. Light anesthesia or analgesia has little application to surgery, but is of paramount importance in obstetrics, operative interferences excepted. The contractile property of the uterine musculature must be efficiently maintained and postpartum hemorrhage minimized. The interests of the child should predominate in the uncomplicated case, for the only consideration for treatment is the relief of pain in the mother.

Chloroform we have discarded because of its toxicity. There is an inherent possibility of sudden death by direct action on the cardiac musculature. Its deleterious effect on liver substance and function is well known, which doubly contraindicates its use in a condition where hepatic dysfunctions are prone to prevail. There is no scientific proof for the time-worn adage that chloroform is better tolerated in the presence of pregnancy.

Ether by inhalation is not wholly satisfactory for many reasons. Its stage of analgesia is not pronounced. Respiratory irritations, blood chemistry imbalances, and aggravations of renal disturbances coincident at times with its use, generally speaking, and, specifically, its inhibiting action on uterine contractions, make this agent far from

*Read at a meeting of the Obstetrical Society of Philadelphia, March 5, 1931.

ideal. Colonic ether, in its many suggested forms, is slightly more advantageous, but the possibility of colonic irritation and the uncertainty of its effectiveness, constitute serious detrimental factors to its use.

The authors next attempted sacral and caudal block anesthesia in a small series of cases. The pregnant abdomen makes the prone position, which is necessary for a skillful injection, very uncomfortable. The length of resulting anesthesia is not sufficient, for many babies were delivered after its effect had disappeared. The painful stimuli from the birth canal only were obviated, the contractions of the uterus being unaffected as to both sensory and motor nerve control. Many patients objected to the numerous injections necessary, which were painful without the customary preliminary hypodermic of morphia.

Nitrous-oxide-oxygen was employed for a long period of time, with excellent maternal and fetal results. This agent possesses many attributes which render it peculiarly adaptable for obstetrics. The great difficulty was in the inconvenience and expense of having the anesthetist available over a long period of time to administer analgesia with each contraction. Especially in primiparae, we were under the impression that the effectiveness of labor was diminished by its use in the first stage.

Sodium amytal was then tried out. Criticism has been directed toward this drug, most of which, however, we believe to be unjust. Unfortunately, the manufacturers supplied quantities to physicians who were not well versed in the principles of intravenous therapy, the action of the barbiturates, and the art of anesthesia. Consequently, rumors of deaths have circulated, but as yet, no official report has come to our notice. Unfortunately, when first introduced, sodium amytal was exploited as an anesthetic as well as a hypnotic. Clinical application has demonstrated that it is unjustifiable to attempt general anesthesia with its use, for a toxic dose is necessary to produce a condition which at best only simulates anesthesia. Nevertheless, the drug received a false stigma for failing to do what never should have been recommended.

DESCRIPTION OF THE TECHNIC OF THE COMBINED ADMINISTRATION

The result sought was that there should be continuous analgesia from the time of administration of the drug until the birth of the baby. A general anesthetic, usually nitrous oxide and oxygen, was given for the actual birth and for the inspection of the cervix and perineum and all repair work.

After the cervix has reached a dilatation of from 4 to 6 cm. sodium amytal is administered intravenously. Only the maximum dosage to be employed is calculated and that by the maternal body weight, namely, 15 mg. per kilo. We make no other effort to predetermine the dosage required any more than we would attempt to predetermine the amount of ether to anesthetize a patient.

The superficial surface over the vein selected is prepared as for any intravenous

therapy and protected by sterile drapings. Ten c.c. of a *freshly prepared* 10 per cent solution in a 10 c.c. syringe is injected at the rate of 0.25 c.c. per fifteen seconds or *slower*. The patient is requested to keep her eyes open. An assistant observes the blood pressure readings. A severe blood pressure fall would contraindicate further injection. Whenever the patient closes her eyes, she is requested to open them. The more difficult it is for the patient to open her eyes, the slower the injection is made. The injection is temporarily stopped when she will no longer respond. No more is administered until the arrival of the next contraction. If this awakens the patient, 1 c.c. more is injected if she has a high tolerance for the drug and 0.5 c.c. if her tolerance is low. Again, the next contraction is awaited with the same course of action. As soon as two successive contractions have occurred, with the patient merely muttering softly to herself and not opening her eyes, the first administration is completed. We are then confident that she is not only analgesic, but amnesic as well.

If the first injection does not remain effective until actual delivery, as may occur in long labors and, because the time of analgesia varies with the individual, we have no hesitancy about administering the second dose. However, since all of the initial dose has not been eliminated, great care should be exercised in giving the second one still more slowly, or the undesirable restlessness of a slight overdose will present itself.

The pains of the contractions will often cause the patient to attempt to move her arms. For this reason, a nurse should hold her arm as quiet as possible, and the anesthetist, by resting the hand holding the syringe on the patient's arm, will avoid infiltrating during the unavoidable slight movement, for his hand will move with the arm.

As the effects of the sodium amytal disappear, if the second stage has been reached, nitrous-oxide-oxygen analgesia is begun. To be successful with gas-oxygen analgesia, the speed of onset of the contraction as well as the individual oxygen requirements of the patient must be taken into consideration. The mother notifies the anesthetist as soon as she is aware of the approaching pain. If rapid, perhaps only one or two deep breaths of a 95.5 per cent or 97.3 per cent mixture are given, and the patient is told to hold the second breath as long as possible and bear down. After each successive breath she bears down until the contraction has ceased, but the mixture should be immediately returned to one of a higher percentage of oxygen after the first breath held, or undesired anesthesia will result. If the onset is slow, three or four breaths of a 90-10 per cent or 88-12 per cent mixture will be sufficient and the third or fourth breath the first one to be held. Experimentation and previous experience will allow the anesthetist to adjust the mixture of nitrous-oxide-oxygen to the optimum combination for efficiency after only four or five contractions.

For the actual delivery, or for operative interference, full anesthesia is instituted. In normal and operative deliveries other than cesarean sections, no rebreathing should be allowed, for the respiratory stimulating properties of carbon dioxide may cause the child to attempt to breathe in the birth canal and inspire blood, mucus, etc. For cesarean section, this will not occur and stimulative or slightly excessive rebreathing before delivery will be an aid toward resuscitation. Nitrous-oxide-oxygen, if thoroughly understood by the anesthetist, will provide satisfactory relaxation for all operative interference, save possibly internal podalic version.

CLINICAL OBSERVATIONS

Time of Injection.—It was found that the time of administration of sodium amytal in the course of labor is important. In a primipara,

the drug should not be injected until the cervix is partly effaced and dilated about 5 cm. The rhythm of the contractions should be well established, occurring every two to four minutes, and lasting forty-five seconds to one minute. In multiparas, the drug may be administered earlier, but pains should be regular and fairly strong; i.e., not more than three to four minutes apart and lasting at least forty-five seconds. If sodium amytal is administered at an earlier stage of labor, it may cause delay, as the interval between contractions is then prolonged and the strength of each contraction slightly diminished. On the other hand, when labor is further advanced, with strong and frequent contractions at time of administration, there is little or no effect observed on the strength and frequency.

Dosage.—It is important to note that the dose should not be based as much on the weight as upon the individual patient's reaction to the drug. The usual analgesic dose is calculated as 15 mg. for each kilo of body weight, but only twice was this dose used. In 4 cases the dose was between 90 per cent and 99 per cent of this dosage; in 3 cases, between 80 per cent and 89 per cent; in 8 cases, between 70 per cent and 79 per cent; in 6 cases, between 60 per cent and 69 per cent; in 5 cases, between 50 per cent and 59 per cent; in 1 case, between 40 per cent and 49 per cent; and in 1 case, between 30 per cent and 39 per cent. In most cases, therefore, it is not necessary to use as much as the calculated analgesic dose and, as the toxic dose is far greater than the analgesic, it will be seen that the danger point is never approached. The rate of injection is important and, as previously advised, should not be faster than 1 c.c. per minute. In two of our cases, Nos. 5 and 6, we tried injecting 2 c.c. the first minute and then 1 c.c. thereafter with the result that narcosis was induced more quickly but it wore off much more rapidly, so that a very unsatisfactory effect was obtained. In all other cases where there was no change in the rate of injection, analgesia was not obtained so quickly, but the effects lasted much longer.

Effects on the Patient.—The action is prompt and before the needle is withdrawn the patient is in light narcosis. She will sleep quietly between pains, but with each uterine contraction will be partly aroused and show slight restlessness, reply to questions, or complain of discomfort. As the effects wear off, she may apparently regain partial consciousness, but because of the amnesic effect will remember little or nothing of the labor.

When the head reaches the perineum and the general anesthetic, nitrous-oxide-oxygen, is administered, there is complete analgesia with each pain, the patient remaining in light narcosis between pains. She will still respond when spoken to and use her voluntary muscles to help expel the fetus, so that none of the force of labor is lost. Inquiry of the patient's own estimate of the amount of relief from pain that

she received, showed that 22 patients, or 73 per cent of the series received complete, or almost entirely complete, relief from pain from the time of the injection to the end of labor; 4 patients received partial relief, i.e., from 50 per cent to 90 per cent; and 4 patients received but little relief and were classed as failures.

Of the four failures, two of the patients were those in whom we attempted a rapid administration of the drug in the first minute with the result that although analgesia was quickly obtained, it soon wore off so that the desired effect was lost. In the other two cases, the drug was given too early, with the result that there was some slowing down of labor until the effects wore off, when labor proceeded again without analgesia. Our four failures were due to errors of application rather than a failure of the drug to act.

Restlessness is a symptom frequently reported by other investigators of the clinical action of this drug and, in our opinion is its most unsatisfactory manifestation. From our observation, we would say that it is largely dependent upon the temperament of the patient and the quantity of the drug administered. A patient with an excitable temperament is far more prone to develop restlessness than one in a calm, cheerful frame of mind. On the other hand, the larger doses of the barbiturate will cause restlessness, even in a calm temperament. Correct technic in administration will control this. Therefore, it is important, when injecting the drug, to adjust the dose to the requirements of that individual, namely, enough to produce analgesia, but not enough to cause restlessness. The ability to judge the correct dose of sodium amytal, or any other anesthetic agent, such as ether or nitrous-oxide-oxygen, depends upon the experience of the one administering the drug. The dose will be governed by the reaction of that particular individual, rather than by an arbitrary calculation based on the body weight. The degree of restlessness which occurred in this series included 1 case of severe restlessness; 3 of moderate restlessness; 7 of slight; and 19 with little or none. Of the 11 cases of restlessness, 7 of the patients were of an excitable temperament and 4 calm.

Duration of Effects.—The longest period of analgesia was seven hours, and the shortest forty-five minutes. In 2 cases repeated doses were used and analgesia was obtained for three and one-half and five hours respectively. In general, an effect lasting two to four hours is obtained. This may be augmented or even extended by the use of nitrous-oxide-oxygen. However, gas and oxygen should not be started until the second stage of labor. If the effects of the barbiturate begin to wear off before this time, a second injection may be given. This dose, of course, should be much smaller.

Effects on Labor.—Sodium amytal has little or no effect on a normal labor if given at the proper stage. The only deleterious effect ob-

served is a slight lengthening of the interval between pains, and of the strength. This soon wears off and labor continues as before. This effect was observed in 10 cases or 33 per cent of the series. In those cases where a prolongation of the interval between pains occurred, the drug was administered earlier in labor. When the cervix is dilated between 5 and 10 cm. before injection, little or no effect on the uterine contractions was observed. The effect on the cervix is that of relaxation. A spastic cervix or retraction ring of the lower uterine segment will relax, under the effect of the drug. In this respect, the drug would seem to be of great value and may shorten the time of first stage labor. Case 1 illustrates this point.

A primipara with normal pelvis at term. The patient had been in labor eighteen and three-quarters hours but there had been no progress for four hours. The cervix was only partly effaced and dilated 6 cm. with the occiput on a line with the ischial spines. L.O.A. position. There were good contractions of fifty to sixty seconds' duration occurring every five to six minutes. A diagnosis of spastic cervix or retraction ring was made. The patient was given 1 gm. of sodium amytal intravenously which was the full analgesic dose for her weight of 69.9 kilos. The effect was remarkable. The patient was in complete analgesia with no change in the interval and strength of the contractions and in two hours and forty minutes the cervix was completely dilated and the head had descended 2 cm. One and a half hours after this the patient was anesthetized and delivered by forceps because of a definite slowing of the fetal heart. In this case, the patient made more progress in the five hours of analgesia than she had in the preceding nineteen hours. We have seen this effect in one other case which is not included in this series.

The longest second stage for primiparae was two hours and forty minutes; the shortest, twenty-five minutes, and the average, one hour and twenty-five minutes. For multiparae the longest was two hours and twenty-nine minutes, the shortest, ten minutes, and the average, forty-six minutes. Because of the fact that forceps were used in a number of cases, thus shortening the second stage of labor, no deductions can be made from these figures. However, it is our observation that sodium amytal has little or no effect on second stage, neither shortening nor prolonging it.

Sodium amytal is also useful when used as a sedative to promote rest during a long labor, as shown in the following case:

This patient was a primipara with a flat rachitic pelvis. She had been in labor twelve hours and had begun to develop signs of fatigue. The cervix was partly effaced and dilated 3 cm., the head was in R.O.P. position and 3 cm. above the ischial spines. Seven-tenths gm. of sodium amytal was given intravenously which put the patient at complete rest for three and one-half hours, at the end of which time she awoke much refreshed and labor continued satisfactorily, being terminated by low forceps.

Sodium amytal has no effect on the fetal heart rate before birth. It does not have any effect on the respirations or heart after birth, so

that resuscitation is the same as if no analgesia had been given. However, it does make the baby drowsy for the first twenty-four or forty-eight hours. This phenomenon was present in 14 cases or nearly 50 per cent of the series, but as this did not seem to affect the baby in any other way, we do not consider it a serious drawback.

CONCLUSIONS

Sodium amytal has two disadvantages: first, administration requires some technical skill and, therefore, the drug cannot be administered by a nurse; second, that it produces restlessness.

In comparison with other forms of obstetric analgesia, we would say that this method of using sodium amytal intravenously in conjunction with nitrous-oxide-oxygen presents the following advantages: an immediate positive action, accurate control of dosage, no deleterious effect on mother or baby, no deleterious effect on labor if properly given, sustained effect over a considerable period of time, furnishes a satisfactory method of treating spastic cervix or retraction ring, and, gives definite rest in fatigue occurring during labor.

We, therefore, believe that sodium amytal is of definite value in obstetric analgesia, particularly during first and second stage of labor.

MEDICAL ARTS BUILDING.

250 SOUTH EIGHTEENTH STREET.

(For discussion, see page 132.)

Dencks: The Relationship of the Female Genital Organs to the Appendix. *Monatsschr. f. Geburtsh. u. Gynäk.* 87: 76, 1931.

The author reports on two patients in whom in spite of three laparotomies the appendix had not been removed and an attack of appendicitis made a fourth abdominal operation necessary. Statistics vary on the frequency of the association of salpingitis and appendicitis. Certain forms of dysmenorrhea have their origin in appendicitis. Further proof that the appendix is frequently an offender is the relationship between appendicitis, cholecystitis and gastric and duodenal ulcers. All these facts speak for the prophylactic removal of the appendix. However, if there are technical difficulties involved in the removal of a harmless appendix, the latter should be left alone, for no unnecessary risk should be taken. The patient's consent for the removal of the appendix should be obtained before operation.

In all cases of appendicitis where adnexal involvement appears to be present, the incision should not be lateral but midline or transverse.

J. P. GREENHILL.

UTERINE ABSCESS, HYSTERECTOMY, RECOVERY*

BY R. A. LIFVENDAHL, M.D., CHICAGO, ILL.

(From the Department of Gynecology of the Post Graduate Hospital and Medical School)

THE occurrence of a solitary intramural uterine abscess in the puerperium is relatively rare because of certain anatomic factors. The marked vascularity of the puerperal uterus favors a diffuse suppurative process and against solitary abscess formation in the uterine wall. The normal phenomena of uterine involution with compression of the lymphatic and vascular channels by contracting muscle fibers and the occlusive endothelial vascular growth prohibit ingress of pathogenic organisms. However, the placental site is more susceptible because of the greater amount of endometrial denudation, a slower degree of involution, and the comparatively large size of the blood vessels. Most of the cases previously recorded have followed the use of forceps, version and extraction, removal of the placenta, and intra-uterine irrigation but instances have been reported after a normal delivery. Trauma to the uterine wall during instrumental attempts at abortion have furnished a moderate number of cases in the literature. Bacteriologic investigation has demonstrated streptococci, staphylococci, colon bacilli, tubercle bacilli and gonococci. Other unidentified organisms as gram-positive cocci in pairs and gram-negative bacilli have been found.

Pathologically, the lesion may be subserous or submucous, but most frequently it does not communicate with the peritoneal or uterine cavities and seems to prefer the cornua as a site of election. It may be the only local cause for the general symptoms or it may give rise to extensive pelvic peritonitis or cellulitis, pyosalpinx, phlebitis, and lymphangitis. The omentum or adjacent intestines may be secondarily involved or perforation may occur into the abdominal cavity. Pichevin and Franque saw patients in whom the purulent contents from the abscess cavity emptied per vaginam. The primary inflammatory process localizes itself in (1) the blood vessels, (2) the lymph vessels, or (3) in the interstitial tissue. In metrophlebitis the veins are directly invaded, become thrombosed and then infected. On the other hand infection may occur secondary to a perivenous inflammatory process. From here infection may extend through the broad ligaments into the ovarian plexus thence into the inferior vena cava or into the left renal vein. If the pampiniform plexus is involved then the hypogastric and the common iliac veins or the tubal or ovarian branches may be

*Presented at a meeting of the Chicago Gynecological Society, March 20, 1931.

thrombosed. In puerperal metrolymphangitis the subserous lymph vessels in the region of the cornua uteri are especially involved and frequently the surrounding myometrium is phlegmonous. Lymphatic spread occurs into the broad ligaments and the retroperitoneal pelvic connective tissue. The interstitial or parenchymatous type of infection may occur particularly after direct trauma to the wall following instrumentation.

REPORT OF CASE

The following history and findings were given by Dr. E. S., who confined the patient.

White, twenty-four years of age, second pregnancy, the first terminated at two months by an uncomplicated induced abortion six months prior to her last preg-



Fig. 1.—Multiloculated intramural uterine abscess filled by organizing thrombus.

nancy. She entered the hospital after a normal prenatal course. The fetal heart tones on entrance were recorded as normal by several observers, in the left lower abdominal quadrant, the cervix dilated to 2 cm., temperature normal, membranes intact, and the mother's condition excellent. Because of the slow progress and some doubt concerning the presence of fetal heart tones after twenty-four hours, an x-ray was taken which showed what was interpreted as a live fetus in cephalic presentation. At the end of forty-nine and one-half hours dilatation was complete with the head in the mid pelvis. An episiotomy was performed, forceps applied and what was described as a macerated fetus was extracted sixty-five minutes after dilatation was complete. Almost immediately following the delivery the maternal pulse became imperceptible, cyanosis was present and it was thought that an intrauterine hemorrhage had occurred, therefore, a manual removal of the placenta was done and the uterine cavity was irrigated with normal saline. Following the administration of stimulants and normal saline solution her general condition improved except for the repeated occurrence of sweats during the subsequent twenty-four hours.

On the second day postpartum the tissues about the episiotomy wound were red, swollen, and tender and by the ninth day there was a large gaping and sloughing wound over which poured profuse and foul-smelling lochia. The leucocyte count on the seventh day was 17,200. Repeated catheterization was necessary on the ninth, tenth, and eleventh days, obtaining from 1,300 to 2,200 c.c. of urine. A blood culture taken on the seventeenth day showed gram-positive paired cocci and the white blood count was now 22,300. The temperature rose to 100.8° on the fifth day and gradually reached 105.4° on the eighteenth day, after a very irregular course. From the fifteenth to the eighteenth day she had numerous chills, perspired freely, vomited several times, and her prognosis became questionable. The temperature curve is somewhat altered due to the fact that aspirin and quinine had been administered.

Consultation was obtained from the medical department who advised blood transfusion if the blood cultures showed no growth.



Fig. 2.—Wall of uterine abscess showing well advanced hyalinizing thrombus in central portion of figure.

On the seventeenth day of this prolonged septic course following delivery she was seen in consultation by E. R. who noted the following on careful rectal examination; a soft, large uterus of decreased consistency with its fundus a hand-breadth above the symphysis. To the left of the uterus a lemon-sized and tender mass which showed a slight degree of movability in relation to the uterus, however, tests of movability were not forced for obvious reasons.

Three days after consultation, on the twentieth postpartum day with a temperature of 102.8° the patient was operated upon.

Operation by Dr. Emil Ries. Intrauterine irrigation with normal salt solution. Median incision from symphysis to umbilicus. Careful exploration revealed the enlarged uterus freely movable and examination of the infundibulopelvic and broad ligaments revealed no thromboses in any of the venous plexus. Uterus pulled up into wound by means of forceps applied across broad ligaments. Amputation by conical incision well below internal os across cervix, leaving only a very small cap

of portio vaginalis. Broad ligaments closed and sutured to lateral aspect of cervical stump which was sutured over with bladder peritoneum. Abdomen closed without drainage.

The postoperative course was uneventful except for a rise of temperature to 103.6° on the third day following the operation. Blood cultures taken on the fourth postoperative day were negative for any organisms and the leucocyte count was 13,900 on this day. The patient left the hospital on the twelfth day following the operation and to date is in good condition.

Specimen: The uterus was 12.5 cm. longitudinally, 9 cm. across the fundus, 4.5 cm. through the right horn, and the wall varied from 2.3 to 2.8 cm. The left horn was symmetrically enlarged and had an anteroposterior diameter of 6.3 cm. This region was firm except for a fluctuating focus in the left side of the posterior fundic wall. Sagittal incision through this portion revealed an abscess 2 cm. in the transverse axis of the uterus and from 4 to 8 mm. in the longitudinal and



Fig. 3.—In center a partially thrombosed vessel that leads directly into the cavity of the abscess.

anteroposterior directions. This cavity had an irregular wall which was studded with punctiform dull red areas and was filled by thick, yellowish and creamy liquid. Cultures of this pus showed few nonhemolytic streptococci, gram-positive paired cocci, and gram-negative bacilli. This abscess was separated from the uterine cavity by 1 cm. of myometrium and from the fundic serosa by 5 mm. of similar tissue. Multiple sections of the remaining portion of the uterus revealed a moderately firm musculature that contained no other abscesses. The uterine cavity was lined by red, thin and easily detachable tissue.

The medial 4.5 cm. of the left and 2.5 cm. of the right fallopian tubes were grossly normal.

Two to 4 mm. of the broad ligaments attached to uterus showed no abnormal thickening or thrombi in any of the vessels.

Microscopic Examination.—Uterine wall including abscess area (see Fig. 1) shows the cavity of the abscess traversed by several strands of edematous muscle fibers which separate the space into smaller compartments. These cavities are

filled by erythrocytes and leucocytes in various stages of disintegration. The wall of the abscess is lined by myometrium, fragments of vessel walls, many newly formed capillaries, and in places (see Fig. 2) by large hyalinizing thrombi which are adherent to the wall. Fig. 3 shows a vein containing an organized thrombus and from this vascular channel a tract leads directly into the abscess cavity. Serial sections of myometrium between abscess and underlying uterine cavity show venous channels containing red and white blood cells and the endometrium at this site shows no evidences of regeneration.

Sections from the right and left mid corporeal regions show mucosal glands in various stages of regeneration overlying a myometrium that is the site of slight interstitial edema and hyalinized vessels. Cervix, the small portions of broad ligaments and fallopian tubes are free from any abnormalities except for a moderate amount of interstitial edema.

Discussion.—Etiologically, several factors undoubtedly played a rôle in the pathogenesis of this solitary intramural uterine abscess in that the possibility of carrying virulent organisms into the uterine cavity could have occurred with either or all of the procedures that were resorted to in this delivery; namely, the use of forceps, followed by manual removal of the placenta and then the intrauterine irrigation. Each of these procedures, individually resorted to has resulted in uterine abscesses in some of the cases reported in the literature. The histologic changes indicate that the pathologic condition was an inflammatory process of the blood vessels rather than a lymphangitis or interstitial metritis. This statement is based upon the fact that the contents of the abscess is composed of red and white blood cells, which mixture would hardly occur in a lymphatic channel, in that here the contents would consist of leucocytes only, unless there had been secondary bleeding into the lymphatics. Furthermore, the presence of organized thrombi in the abscess wall indicates that the process had been present for some time. In addition, the finding of a partially thrombosed vessel with a mural defect leading into the abscess cavity points to a primary vascular lesion. Moreover, examination of the endometrium in the abscess area shows no evidences of regeneration of the endometrial glands or stroma. This would tend to indicate that the placenta was located here and its site possibly served as a pathway for the bacteria to gain access to the veins.

The diagnosis of a pelvic puerperal infection is usually easy but to localize it as limited to an intramural uterine abscess is almost impossible. The condition is extremely rare as compared to the usual widespread infection, and the lesion is usually small. In this case the swelling of the left uterine horn was sufficiently large to give the impression of a mass that was movable in relation to the body of the uterus. This apparent discrepancy has been explained on the basis of the external uterine surface, overlying the abscess, being movable over the fluctuating area. This same finding has been recently noted by Viridis. This phenomenon would be especially manifest if gas pro-

ducing organisms were present in the abscess. In this case no gas producing organisms were found on culture nor were there any gas bubbles in the interstitial tissue surrounding the abscess. To detect an abscess in the wall after the abdomen is opened is not always possible unless it has attained an appreciable size and is surrounded by considerable inflammatory edema. Thorough palpation of the uterus is not deemed desirable because this may spread infected material into structures beyond the reach of surgical aid. If the infection has resulted in swelling of the subserous layers it can easily be recognized but then it also can be easily ruptured on bimanual examination. Also, this area may be covered by adherent omentum or intestines, freeing which may spread infection into the abdomen before the latter has been packed off. Therefore, the possibility of a uterine abscess being present should always be kept in mind when resorting to operative interference in a puerperal septic case.

In the differential diagnosis a degenerating infected fibroid, pyosalpinx, or a diffuse panmetritis have all been considered in many of the previously recorded cases before the operation or autopsy.

There always exists the uncertainty whether or not the patient might have recovered without operation. We do know, however, that the majority of previously described cases are fatal in that they have been obtained at the autopsy. Also, the mortality in severe puerperal infections is enormous and the general trend at the present time is early and radical surgical treatment, especially in Europe.

Before the abdominal operative work, an intrauterine irrigation of normal salt solution was advisable in order to prevent the escape of any infected material from the uterine cavity during the later operative steps.

In our patient a median incision was made rather than the usual Pfannenstiel incision because preoperatively it was realized that ligation of thrombosed renal veins might become necessary, thus requiring extension of the incision almost to the ensiform process. Also the possibility of carrying infected material into the layers of the flaps in the transverse incision was kept in mind.

Exploration of the possibly thrombosed venous channels was performed with most careful manipulation. After determining the absence of extruterine venous thrombophlebitis the corpus uteri was delivered into the wound by forceps placed across the upper portions of the broad ligaments near the uterus thus preventing infected intrauterine substance from gaining access to the previously normal venous channels.

The question of a more conservative procedure than a hysterectomy has always been open to discussion. In the literature there are cases in which incision and drainage or excision of the abscess has resulted in the patient's recovery and in several instances a normal delivery

has followed at a later date. Realizing the difficulty of determining how many abscesses are present the safest procedure is to remove the entire uterus. In this patient the typical supravaginal hysterectomy was not done because of the possibility of leaving infected cervical tissue. Instead, only a small shell or cap of the vaginal portion was left behind which gave adequate support to the cardinal ligaments.

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FRACTURED PELVIS IN OBSTETRICS (WITH REPORT OF CASES)*

BY WILLIAM SCHUMAN, M.D., BALTIMORE, MD.

(From the obstetrical service of the Sinai Hospital)

MODERN methods of transportation, with particular reference to the widespread use of the automobile, have given rise to many new problems. Medicine, along with other sciences and industries, has been tremendously influenced thereby, and while no disease per se has been created, unless it be automobilism (a mental ailment), the great number of injuries resulting from automobile accidents has greatly added to the experience of the surgical and orthopedic practitioner. In obstetrics, as well, we are now beginning to see the effects of trauma in traffic mishaps, the pelvis, of course, being the chief center of interest. Textbooks devote little or no space to injuries of the pelvis and their relation to childbirth, and references in the literature are infrequent, because it has only been during the past decade or less that such cases have ceased to be a rarity. Williams, in his chapter on "atypical deformities of the pelvis" gives an illustration of a fractured pelvis from a case reported by Mars.

The paragraph treating of fractures of the pelvis is so brief that it can be quoted in its entirety. "In rare instances healed fractures of the pelvis may offer an insuperable obstacle to the birth of the child, owing either to an excessive formation of callus or to the projection of the broken ends of the bones into the pelvic cavity. This condition, however, is very rare, as it is stated that only 0.8 per cent of all fractures involve the pelvis, and in such cases the internal injuries are usually

*Read before the Baltimore Obstetrical and Gynecological Society, January 9, 1931.

so severe as to lead to the death of the patient, so that only a small proportion of such women survive, and very few of them become pregnant. The effect upon labor depends upon the location of the fracture and its manner of healing. . . . In a case reported by Neugebauer, in which there was a transverse fracture of the second sacral vertebra, the vertebral column prolapsed into the pelvic cavity and gave rise to a deformity suggestive of *spondylolisthesis*."

Every physician, particularly the urologist, is familiar with the results of a crushed pelvis, but it is unusual for one to think in terms of obstetrics when one sees a woman or even a little girl who has been in an automobile accident. Naturally, if the woman is known to be pregnant at the time, everyone is concerned not only about her but also for her unborn child. In one of the cases I am going to cite, the woman was three months pregnant at the time of the accident. Most of the few instances of fractured pelvis seen in the parturient are those sustained in early life or when the individual is not pregnant, either before the first pregnancy or between pregnancies.

Since the last edition of his book, Williams has had two cases of fractured pelvis, those being the only two cases among 40,000 deliveries at the Johns Hopkins Clinic. From one he has obtained the pelvis, and it is the only specimen of fractured pelvis in his collection of abnormal pelves.

In a recent article "Acute Fractures of the Pelvis" by Lloyd Nolan and H. Earle Conwell of Fairfield, Ala. (January 18, 1930, *J. A. M. A.*) reporting a series of 125 cases of fractures of the pelvis, the authors state:

"It is interesting to note that pelvic fractures in women during the first three years covered by this series, that is from 1920 to 1923, constituted only 10 per cent of the total civilian accidents. Since 1923, or in the last five years, fractures of the pelvis in women amounted to almost 50 per cent of the total civilian cases; 75 per cent of these pelvic fractures in women were received in automobile accidents, and, as far as we are able to judge, such fractures were definitely caused by trauma of less severity than that producing such fractures in men." On reading this article, I noted that no mention was made of the obstetric phase of the subject, and hence I wrote to the authors, asking them if they could obtain the obstetric history of these patients subsequent to their fracture. In their reply, they cited just one case as follows:

A primipara, aged twenty-six became pregnant six months after pelvic fracture, which was of the anterior ring, without much deformity but with considerable callus formation. Patient was observed through her pregnancy, and after consideration, it was decided it would be dangerous to allow her to go to full term. Labor was induced at the end of the eighth month, without any complications.

A communication from the New York Lying-In Hospital states that in over 170,000 births, dating back to January, 1890, records show only one case of pelvic fracture, the outline history of which is as follows:

Mrs. J. G., aged thirty-one, white, para 6, applied on August 23, 1929, for care in childbirth. She gave a history of having been in an automobile accident on June 9, 1929, and as a result of the injury sustained at that time, walked with a slight limp. Examination showed patient had a lump on the right descending ramus of the pubis, which was thought to be a callus at the site of a probable fracture. This, apparently, in no way interfered with her labor, as noted below. She was

kept under observation until Nov. 28, 1929, and after a labor of eight hours, ten minutes, was spontaneously delivered of a full-term living child weighing 4,200 gm. Convalescence was uneventful, and patient was discharged Dec. 8, 1929, apparently in good condition.

DeLee writes he has had several cases of fractures of the pelvis in labor. It was necessary in no one of them to do a cesarean section. One had to be delivered on the side to accommodate a proper mechanism of labor.

Greenhill had under his care a doctor's wife, who suffered a fracture of the pelvis just before her first pregnancy. She was delivered by low forceps.

Polak of Brooklyn has had two such cases. Both were caused by the woman being thrown from a horse, and the horse falling upon them. Both fractures included the ilium and pubis. Both healed without any pelvic deformity; each woman has borne a child since without complications, either during pregnancy or labor. The x-ray has shown the fractures well united.



Fig. 1.—X-ray of pelvis of Case 1, showing old fracture of pelvis, marked displacement of symphysis pubis and part of symphysis detached.

CASE REPORTS

During the past few years, two patients giving a history of fractured pelvis, were each delivered twice in the maternity of the Sinai Hospital.

CASE 1.—S. I., aged twenty-one, para i, first appeared in the prenatal clinic April 10, 1929. She sustained a fractured left hip (patient's own words) seven years before, as a result of having been run over by a wagon. Examination with routine pelvic mensuration revealed no apparent deformity of the bony pelvis, measurements being as follows: Sp 26, Cr 28, Tr 30, Bd. 18, C.D. 12. Outlet contracted. IT, 7. Unfortunately, no x-ray was taken during the prenatal period. Her last period was Aug. 15, 1928, making her at term May 22, 1929. The prenatal record showed no complaints that could be attributed to a fractured pelvis. She came to term without lightening occurring. When one month over-

due, July 8, 1929, she was sent into the hospital, the head floating, urine showing a trace of albumin. Blood pressure not elevated. Routine admission examination was essentially negative, there being no atrophy or paralysis; reflexes normal. Patient showed no disturbance of gait or difficulty in walking. Early on the morning following admission, she was given castor oil and quinine, without effect. Eight hours later, more oil and quinine were given, and one-half hour after the last dose of quinine, pains started. The head was not engaged. The cervix dilated moderately slowly, and toward evening $\frac{1}{4}$ gr. of morphia was administered. At this time, the cervix was about 5 cm. dilated, the head low in the pelvis. At 10:30 that night, the membranes evidently ruptured, and meconium stained fluid came away slowly. Great significance was not placed upon this, however, because of the large amount of quinine the patient had, and because the fetal heart tones remained good. The first stage ended at 1 A.M., July 10, duration twelve hours. The head was now on the perineum, meconium stained fluid continued to drain away. After an hour of second stage pains, the fetal heart became very rapid (170-200) and the patient was delivered with low forceps and episiotomy. It was an R.O.A., and the delivery easy. The baby, which weighed 8 pounds was asphyxiated, and great difficulty was encountered in making it breathe. It died on the second day. Autopsy showed a normal full-term male child with no evidence of trauma externally. Anatomical diagnosis: Partial atelectasis, enlarged thymus—25 gm. (normal 13), peculiar mottling of aorta (not diagnosed).

On the first day of the puerperium, the patient complained of pain in the right foot, and numbness in the right leg and foot. This persisted throughout the twelve days she remained in the hospital, there being no other symptoms or objective findings. Her maximum temperature was 100.2 on the fifth day. Patient returned to the postnatal clinic on August 10, complaining of pain in the right leg. On August 28, she applied to the Johns Hopkins Dispensary, complaining of weakness in the right leg. A member of the staff of the Orthopedic department found a hyperesthesia along the course of the external peroneal nerve, atrophy of the thigh, and calf, one inch. Weakness in the tibialis anticus, posterior tibial, and gluteals. Spine essentially negative.

X-ray showed an old fracture of pelvis, marked displacement of symphysis pubis; part of symphysis broken loose. (Fig. 1.)

She returned to the dispensary a few times for baking and massage, and subsequently, "Social Service" reports, the patient resumed work, apparently not disabled.

On June 16, 1930, I was surprised to see the patient in the dispensary, again applying for a bed in the maternity. The expected date of confinement was July 22, 1930, just one year following her first labor. Pelvic measurements were the same as on her first examination, essentially normal with the exception of a somewhat contracted outlet. The deformity of the symphysis and descending rami of the pubis was easily felt on vaginal examination. X-ray showed the old fracture at the symphysis, pelvic outlet markedly distorted; head of fetus over pelvic brim. Attempts to push the head into the pelvis caused the patient to experience sharp pain in the right gluteal region in the course of the sciatic nerve. This observation was considered significant, recalling her neurologic disturbances in the right lower extremity following her first labor. She was admitted to the hospital on July 23, 1930, one day over term, not in labor. In view of the dystocia, the infant death, and the puerperal complications of the other labor, cesarean section was done June 25, by the classical incision. The child was alive, female, and weighed $7\frac{1}{4}$ pounds. The mother had an uneventful puerperium, and was discharged August 9, much happier than one year before. She and her baby are in good health at the present time.

CASE 2.—Mrs. M. P., first appeared in the prenatal clinic October 29, 1926. She was at that time thirty-three years old, para iv. She was in an accident on July 19, 1926, when three months pregnant, sustaining a broken pelvis, ribs, and shoulder. She delivered spontaneously on Dec. 31, 1926. She returned May 24, 1929, at this time para v. Measurements were normal. X-ray revealed an old fracture of the right ischium, good position. This pregnancy also terminated in a spontaneous delivery, no complications ensuing.

These cases demonstrate that fracture of the pelvis in the female may or may not constitute an obstetric complication, depending on the extent of the injury, location of the fracture, amount of callus formation, etc. On the basis of my experience with this complication, limited though it may be, yet I cannot agree with the statement of Williams, that "in such cases the internal injuries are usually so severe as to lead to the death of the patient, so that only a small proportion of such women survive, and very few become pregnant." We must not overlook the important observations made by Noland and Conwell that female pelves are fractured more easily than male; which may account for the fact that women do survive these injuries and do become pregnant subsequently. Internal injury, therefore, does not follow every fracture of a female pelvis.

I am reporting these cases because of the paucity of literature on the subject of fractured pelvis complicating pregnancy and labor, and because of the apparent increase in the number of cases coming to our attention due to the accidents of modern traffic and industry. I make it a routine in taking obstetric histories to ask the patient if she has ever been run over or injured about the pelvis in any way, and if there is a positive history, an x-ray of the pelvis is taken in the prenatal period as well as postpartum.

Since the preparation of this paper, there has been reported a case of fractured pelvis by Ward L. Ekas, of Rochester, N. Y. (AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY, May, 1931). The deformity of the pelvis in his case resembles very much that reported here (Case 1), but his case terminated spontaneously without complications. Ekas' case and those reported here are apparently the only ones to be found in contemporary medical publications of this country.

2340 EUTAW PLACE.

(For discussion, see page 141.)

CARCINOMA DEVELOPING IN A MYOMATOUS UTERUS AFTER X-RAY MENOPAUSE*

BY CATHARINE MACFARLANE, M.D., F.A.C.S., PHILADELPHIA, PA.

An unfamiliar factor, the development of carcinoma many years after x-ray treatment, was illustrated by a case under my care during the past year which seems of considerable significance and worth reporting.

Alice T., married, white, sixty years of age, was admitted to the Woman's Hospital on January 7, 1930 complaining of a more or less constant, blood-stained vaginal discharge of seven months' duration.

In 1914, when forty-four years old, she consulted her physician on account of profuse periods and was told she had a tumor the size of "a half loaf of bread." Operation was advised but refused. Her periods were checked by a series of x-ray treatments given by Dr. George E. Pfahler.

Fifteen years later (June, 1929) after a fall, she noticed a slight, blood-stained, vaginal discharge and was brought to me by her physician, Dr. Ellen E. Brown, of Chester.

I found the abdominal wall densely infiltrated as a result of the x-ray treatment and the overlying skin scaly and of a purplish pink color. Pelvic examination showed an irregularly nodular, movable uterus reaching halfway to the umbilicus. Inspection of the cervix showed a moderate degree of endocervicitis which seemed sufficient to account for the slight blood-stained discharge.

This discharge continued and in September, 1929, during my absence from the city, the patient consulted Dr. Pfahler who curetted her without anesthesia, obtained a negative report on the scrapings and made an intrauterine application of radium.

The blood-stained discharge still continued and in January, 1930, the patient was again brought to me. A curettage was performed under ether with the greatest difficulty because of the distortion of the uterine cavity caused by a large submucous nodule projecting into it. Scanty insignificant scrapings were obtained and 75 mg. of radium were placed in the uterine cavity for twenty-four hours. A few days later, Dr. Berta M. Meine reported the presence of adenocarcinoma in the scrapings. Two weeks later I performed an abdominal panhysterectomy with removal of both ovaries and tubes.

There were no adhesions. The broad ligaments were free. The uterus reached to within two inches of the umbilicus, it presented several subperitoneal nodules 4 or 5 cm. in diameter, and was delivered with considerable difficulty owing to the rigid infiltration of the abdominal wall. Upon opening the uterus a submucous nodule about 5 cm. in diameter, was found just above the internal os. The endometrium opposite this nodule, about two and a half cm. above the internal os, presented a roughened area. Sections from this area showed adenocarcinoma.

The patient stood the operation well. In spite of the induration of the abdominal wall, the incision healed by first intention, within a few weeks, however, a dense infiltration appeared in the vaginal vault. This steadily increased. It eventually surrounded the rectum causing complete obstruction for which a co-

*Read before the Obstetrical Society of Philadelphia, March 5, 1931.

hystectomy was performed by Dr. John B. Carnett. About three months after the panhysterectomy the patient died. There was no autopsy.

While the conduct of this case presents several points which are open to criticism and which might be discussed with profit, the fact to which I wish to call attention is the development of carcinoma in this myomatous uterus fifteen years after x-ray castration. I had never seen nor heard of a similar case.

On reviewing the literature of the past sixteen years, I found only seven articles dealing with this subject. All of these articles were in the German literature.

In these seven articles, 29 cases were reported. Eighteen followed radiation treatment of uterine myomas. Eleven followed similar treatment for climacteric bleeding without pelvic pathology.

Of the 18 myomas, only four had been curetted previous to radiation, in these the microscopic findings were negative. Sixteen had been treated by the x-ray alone, two by x-ray and radium. In one case bleeding returned after six months; in one, after six years; the average time of return was three years. In ten cases adenocarcinoma developed in the body of the uterus; in one case, in the cervix; in 7 cases, squamous celled epithelioma developed on the vaginal portion of the cervix. In the final treatment of these cases, radium was used four times; x-ray once; radical operation eleven times.

Of the 11 cases of climacteric bleeding, 5 had been curetted previous to radiation with negative microscopic findings. Seven had been treated by x-ray, one by radium, three by radium and x-ray. In one case bleeding returned after two months (had not been curetted); in two, after five years; the average time of return was three years. In five cases, adenocarcinoma developed in the body; in 4, in the cervix; in 2 cases, squamous celled epithelioma developed on the vaginal portion of the cervix. The final treatment of 8 of these cases was radical operation, the final treatment of the remaining 3 was not mentioned.

The development of carcinoma in the uterus after radiation is evidently exceedingly rare. Werner of Vienna, on the basis of 2,680 patients treated by radium or x-rays for myomas or climacteric bleeding, reported an incidence of 0.3 per cent, Vogt of Tuebingen, on the basis of 1,300 similar cases reported an incidence of 0.4 per cent. Since carcinoma of the uterus occurs in approximately 5 per cent of all gynecologic cases and in only 0.3 per cent to 0.4 per cent of radiated cases, radiation obviously affords a distinct protection against its development.

In one-half of the cases reviewed in this paper, carcinoma developed in the uterine body; in the other half, in the uterine cervix. The only sure means of preventing its occurrence would be the routine performance of panhysterectomy in all patients with myomatous tumors or climacteric bleeding. Since panhysterectomy in its turn is attended

by a certain percentage of mortality and morbidity this operation cannot be recommended indiscriminately for every case.

From our own experience and from this review of the scanty literature of the subject, it is evident that the possibility of carcinoma developing in the uterus after radium or x-ray treatment is very remote. This possibility does not contraindicate radium or x-ray treatment of myomatous tumors or climacteric bleeding. It does add one more factor to the list to be considered when deciding upon the best method of treating the individual patient.

CONCLUSIONS

1. Carcinoma may develop in the uterus after x-ray or radium menopause.

8. Bleeding from the uterus after the menopause, natural or artificial, must be attributed to carcinoma until proved to the contrary by the microscope.

3. Persistent bleeding from the uterine cavity after radiation treatment indicates radical operation in spite of negative findings on diagnostic curettage.

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701 MEDICAL ARTS BUILDING.

(For discussion, see page 133.)

Finger, J.: Therapeutic Tests with Cholesterin in Septic Diseases. Monatschr. f. Geburtsh. u. Gynäk. 87: 94, 1931.

At the beginning of every acute infection there is a distinct diminution in the cholesterol contents of the blood. If the infection is being successfully combated, the amount of cholesterol increases. Reitzenstein fed rats a diet poor in cholesterol and thereby diminished their resistance against external infection. In human beings cholesterol is toxic, hence it must be used with great caution. The author treated 37 women who had infections by means of intravenous injections of cholesterol. Altogether 264 injections were given. In many cases there were pulmonary manifestations of an embolic nature. Five of the 37 patients died. The author feels that cholesterol helps build up resistance against infection even though the mechanism involved is not understood.

J. P. GREENHILL.

SYPHILIS OF THE FETUS AND NEWBORN INFANT*

BY FRED L. ADAIR, M.D., CHICAGO, ILL.

(From the Department of Obstetrics and Gynecology of the University of Chicago)

SYPHILIS, which is a preventable disease, is still a frequent cause of morbidity and mortality among fetuses and infants. It can be successfully treated only prior to birth. If the condition could be recognized and treated in the parents prior to conception, and failing there, in the mother during pregnancy, the occurrence of this infection in the fetus and the newborn infant could be practically eliminated.

Its frequency, as a cause of disease and death of the fetus and newborn infant, varies greatly in different localities and in various racial groups. The greater attention given to prenatal care and to the prevention and cure of venereal disease has undoubtedly reduced its incidence during the past decade or two.

The eradication of this contagious disease is a problem common to all localities and all countries; there is only the difference in its incidence. The statistics for the different countries are not all given on the same basis so that a comparison is difficult. In a tabulation of stillbirths by the Census Bureau for a selected area (1924), 2.6 per cent were attributed to syphilis.

This does not correspond closely with various series of stillbirths which have been reported on the basis of postmortem study. Varying figures are given from less than 1 per cent to over 40 per cent. Other series are published which give the frequency during pregnancy.

In Brooklyn, New York, Beck reported 1,000 consecutive deliveries prior to 1921 with 3 per cent maternal syphilis. Gebhart found in New York City 23.3 per cent of syphilitics among 1,224 colored pregnant women during the period from 1917 to 1923. Parker found 8.3 per cent in 6,300 prenatal cases. Stillians reported from the Chicago Lying-in Hospital (1917-1928) 6,954 pregnant women, mostly white, with an incidence of 6 per cent, 814 negroes with a percentage of 19.2 and a general average of 7.4 per cent syphilitic. Wilson reported an incidence of 7.5 per cent in 3,631 colored women in Chicago and noted a gradual decline from 15.1 per cent in 1920 to 4.7 per cent in 1927.

Pomeroy in Los Angeles reported 8.1 per cent among 817 Mexican and Japanese women. Sage reported 5.5 per cent in 1,200 pregnant women and 23.8 per cent among 118 stillborn infants. Williams in an earlier series of 4,000 pregnant women (1916-1919) found 11.2 per cent syphilitic, 2.48 per cent among the whites and 16.29 per cent among the colored. In 302 fetal and neonatal deaths 34.4 per cent were due to syphilis.

In Detroit, prior to 1926, among 4,120 white and colored prenatal cases 13.7 per cent were syphilitic. In the prenatal clinic of Birmingham, Alabama, during

*Read before the Chicago Gynecological Society, March 20, 1931.

1928 and 1929 there were 735 white and colored women of whom 22.3 were syphilitic (white 8.7 per cent and colored 24.8 per cent).

McCord reports similar percentages from Atlanta and believes that at least 45 per cent of the stillbirths and the neonatal deaths were due to syphilis.

Similar conditions prevail in Europe. Dodds in Edinburgh found 6.5 per cent syphilitic in 2,000 consecutive cases of pregnancy. Gammeltoft in Denmark found 5.5 per cent of 23,383 pregnant women with evidence of syphilis. Cruikshank in 1920-21 studied 1,881 prenatal cases among which 9.04 per cent were syphilitic, and in 1930 he reported that there had been a reduction in the incidence of syphilis and that syphilis caused less than 1 per cent of the stillbirths.

The transmission of the disease is now generally accepted as being maternal though a few cases in the literature strongly suggest paternal transmission.

The effect on the fetus depends undoubtedly on the virulence of the infection and the resistance of the mother. The older the disease in the mother the less the effect on the fetus. The more adequate the treatment in the mother the less the risk to the fetus.

It is difficult to know whether the toxins may affect the fetus without actual invasion of the fetus with the spirochetes. Usually the organisms can be demonstrated in a fetus recognized as being syphilitic. Not every child of a syphilitic mother is syphilitic. Treatment of the mother in so far as the fetus is concerned is most effective if begun prior to conception. It should be continued during pregnancy. Gammeltoft from a series of 1,290 syphilitic women delivered in the University Clinic at Copenhagen considered that every syphilitic woman should be treated during pregnancy with salvarsan, mercury, or bismuth with no regard to date of initial infection, to previous treatment, or to the presence of a negative Wassermann. In 545 cases, where the infant was followed for half a year or more, he found that of 201 untreated cases there were only 7 nonsyphilitic infants; of 87 mothers treated with mercury only prior to pregnancy there were 9 without syphilis; of 15 treated with salvarsan only prior to pregnancy there were 3 infants without syphilis; of 111 treated with mercury during pregnancy 79 were nonsyphilitic; while with salvarsan treatment before and mercury during pregnancy 19 of 26 were not syphilitic; only 7 were treated with salvarsan before and during pregnancy with 6 infants which were not syphilitic. The best results were obtained with salvarsan before and during pregnancy. It must be used cautiously and discontinued in case albuminuria occurs. The transmission is through the placenta and usually does not occur prior to the fourth or fifth month.

McCord found over 33 per cent of his untreated pregnant syphilitic women had premature or full-term stillbirths as compared with 9 per cent for his treated cases. Many born at term or prematurely did not survive.

In a series of something over 1,000 autopsies on fetuses and newborn infants performed at the University of Minnesota Hospital there were about 46 syphilitic infants, a percentage of 4.4. This included still-born and newborn infants only.

The diagnosis was made upon the presence of one or more of the following conditions: positive maternal Wassermann, the presence of spirochetes, typical epiphyseal changes, characteristic skin changes, and characteristic changes in the viscera, as the spleen, liver, lung and pancreas.

The maternal Wassermann was positive in 28 cases, not done in 6 and negative in 12. Syphilis was not previously diagnosed in the mother in 31 cases and only 3 women had received any treatment, one before pregnancy, one had a single treatment during pregnancy, and a third had treatment throughout pregnancy.

In our entire series there were 501 stillbirths of which 37 or 7.4 per cent were syphilitic; i.e., 80.4 per cent of the syphilitic group; 27 of the 37 or 73 per cent were premature, and 10 or 27 per cent were full term; 33 died antepartum and 4 died intrapartum deaths. Only 9 were born alive, which is 1.6 per cent of the entire group of 543 living births, or 19.5 per cent of the syphilitic group; all of the 9 were premature. Of these respiration was not established in three and 6 died neonatal deaths.

In the whole group of 46 syphilitic infants, 36 or 78.2 per cent were prematurely born and 10 or 21.7 per cent were full term.

Spirochetes were found in the fetal tissues of 41. Osteochondritis syphilitica was present in 37 and was confirmed in all of the 10 cases which were subjected to x-ray diagnosis. Splenomegaly was present in 35, hypertrophy of the liver in 25, gumma of the liver in 3, pneumonia alba in 8, pancreatitis in 11, and skin changes which were characteristic in 19. In the entire series of autopsies there were 10 cases of hydrops fetalis, of which 2 were syphilitic.

Some of the organ weights of this series were plotted against fetal body weight. In these graphs the distribution of weights indicates that when the syphilitic are compared with the nonsyphilitic fetuses there are certain fairly definite differences. A comparison of the placental weights of the two groups shows that the weight of this organ is higher for the syphilitic than for the nonsyphilitic fetuses of a corresponding size. This might be expected because the placenta is usually involved with this disease as might be anticipated from the transplacental transmission. The changes in the placenta are clubbing of the villi, and proliferation of the stroma cells with endarteritis and periarteritis. The cord shows similar changes in the vessels.

The lungs are frequently, but not so constantly, involved which might be anticipated from the fact that they are nonfunctioning organs in the fetus. The weights as plotted show wide variation but

some of these are distinctly heavier and most of them showed evidence of pneumonia alba. Gumma has been described but is rare; pleural thickening has also been noted.

The more common change which is associated with the so-called pneumonia alba is that of interstitial fibrosis and desquamation of the epithelium of the alveoli.

The liver is more frequently involved and the weights are definitely higher for this organ in the syphilitic than in the nonsyphilitic fetuses. Gummas, more commonly of the miliary type, are not uncommon and they may resemble tubercles. Larger ones are less frequent. Retarded development with persistence of hematopoietic islands and embryonic liver columns occurs. Pericellular fibrosis and foci of lymphocytic and plasma cell infiltration are often present. Changes in the vessels are often found. The kidneys are generally of a greater weight in the syphilitic infants. It has been thought that there is a tendency to a persistence of the nephrogenic zone.

Foci of lymphocytic infiltration are present in the intertubular stroma and the subcapsular area. Characteristic vascular changes are also present.

The spleen is definitely enlarged and heavier. The pathologic changes which may be considered pathognomonic are difficult to discover. Hyperplasia with fibrosis is present, together with vascular changes. Gummas also occur and amyloid changes have been described.

(For discussion, see page 140.)

Nürnberg, L.: The Diagnosis of Hydatidiform Mole. *Med. Klin.* 27: 343, 1931.

Nürnberg points out that the only direct evidence of the presence of a hydatidiform mole is the expulsion of vesicles. Usually the diagnosis is based upon indirect evidence such as: unusually large uterus for the corresponding period of pregnancy, abnormal contractions of the uterus, hemorrhages, absence of a fetus, albuminuria and edema. In recent years there has been added a most valuable aid, namely, the detection of an increased elimination of anterior pituitary hormone in the urine. Hence in all cases where there is a suspicion of hydatidiform mole or chorionepithelioma an Aschheim-Zondek test should be performed. If more than 50,000 mouse units are found there are most likely pathologic changes in the placenta. If 200,000 or more mouse units are found, the diagnosis of hydatid mole or chorionepithelioma can be made with certainty.

After a hydatid mole is removed, the urine should be examined at frequent intervals. If the reaction remains positive, it indicates the retention of pieces of the mole or the transition into a chorionepithelioma.

J. P. GREENHILL.

SAMUEL BARD, THE AUTHOR OF THE FIRST TEXTBOOK ON
OBSTETRICS PUBLISHED IN AMERICA

BY HERBERT THOMS, M.D., NEW HAVEN, CONN.

A
COMPENDIUM
OF THE THEORY AND PRACTICE
OF
MIDWIFERY
CONTAINING
PRACTICAL INSTRUCTIONS FOR THE MANAGEMENT OF
WOMEN
DURING PREGNANCY, IN LABOUR AND IN CHILDBED
CALCULATED
TO CORRECT THE ERRORS AND TO IMPROVE THE PRACTICE, OF
MIDWIVES
AS WELL AS TO SERVE AS AN INTRODUCTION TO THE
STUDY OF THIS ART,
FOR
STUDENTS AND YOUNG PRACTITIONERS.
BY SAMUEL BARD, M.D.
PRESIDENT OF THE COLLEGE OF PHYSICIANS AND SURGEONS
IN THE UNIVERSITY OF THE STATE OF NEW YORK.

So appears the title of the first work on obstetrics written in America and published in 1807. (Fig. 1.) At a glance, it may seem strange that this small book could survive the burden of such a title page, but a look into its interior reveals not only much fine obstetric thought but depicts in a splendid manner a good deal of the life and time of its notable author. Furthermore, it will always remain an important landmark in the obstetric annals of America.

The copy which rests upon my desk is one of the "second edition enlarged" and we may believe the inscription on the flyleaf which tells of its purchase in 1817 by Asabel Thompson, M.D., for \$1.10.

It will be a pleasant duty for obstetricians to familiarize themselves with something of the content and author of this book. The gems to be found within its pages are numerous and brilliant, and the present task will be to select a proper few to demonstrate the excellence of the whole.

The soundness of the author's experience is well shown in the introduction, when he writes "there is some reason to believe there is greater safety in this branch of medicine from modest unassuming ignorance, than from a meddling presumption which frequently ac-

companies a little learning." Lest the reader expect too much of the author's effort, he recommends the works of European writers, especially White of Manchester, Denman of London, and Baudeloque of Paris. Bard further states that he had been solicited by his friends in this new edition to include a chapter on the use of instruments. His mature reflection, however, decided against this, and he states that he wishes in the present work to "teach the progress and management of natural labour . . . and I will venture to assert that the better

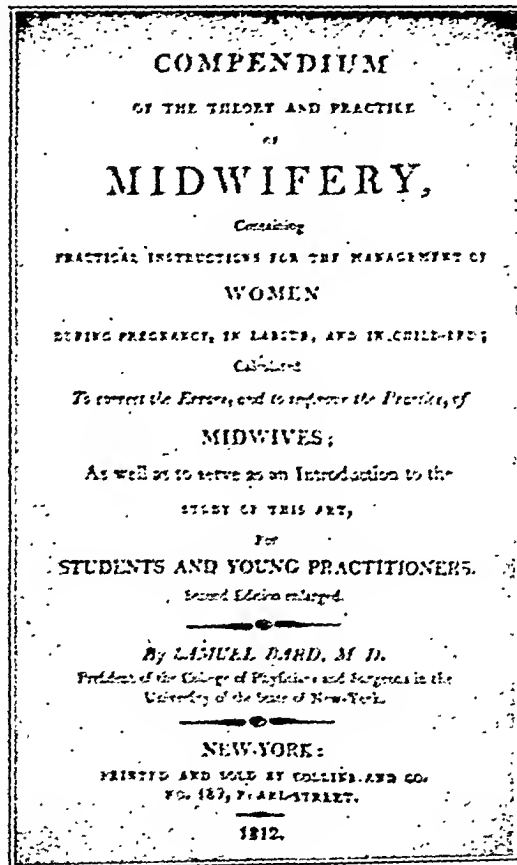


Fig. 1.

the rules here laid down are understood, and the more steadily they are practiced; the less frequently will the necessity of applying to instruments occur."

In the absence of present-day diagnostic refinements for the detection of preeclampsia and preeclamptic states, Bard writes of convulsions that "they are frequently preceded by a very irritable and fretful state of mind, approaching to delirium, and by a restlessness and unaccountable uneasiness of body; by some degree of blindness, and the appearance of motes dancing before the eyes; by a swimming or violent pain of the head, especially on stooping down, by a flushed

countenance, a staring and protruded eye, swelling of the veins of the neck, and throbbing of the arteries in the head; and sometimes by a cramp, or violent pain in the stomach, which is always a dangerous symptom."

Although pelvimetry as we know it was not taught or practiced in Bard's day, still pelvic deformities were recognized, and he gives excellent directions for estimating the diagonal conjugate diameter and for recognizing contractions not only of the superior but also those of the inferior strait.



Fig. 2.—Samuel Bard.

Prolonged vaginal examination and manipulation during labor, a practice still indulged in by ignorant practitioners, was properly scored. "What terms shall I use," he writes, "to condemn as it deserves, the abominable practice of boring, scooping, and stretching the soft parts of the mother, under the preposterous idea of making room for the child to pass? It is impossible to censure this idle, indiscreet and dangerous practice too severely." Later on, this practice is again referred to, "It sometimes happens that the internal orifice of the womb is found remarkably thick and rigid, especially in women advanced in life; in such cases all the advice already given respecting

patience, quiet, delation and a cool regimen, and all the cautions respecting improper interference of the midwife, in attempts to stretch and dilate the parts are more particularly necessary, on account of the importance of the part itself, its extreme sensibility, and the great danger of inflaming it. . . ."

Bard's sound conception of contracted pelves and their relation to successful labor is seen in his discussion of rickets. He writes, "Nor is it only by injuring the shape of the bones, that mismanagement in childhood unfits women for easy childbearing, but by preventing firmness and vigour in general, and occasioning a weak feeble and irritable habit. A sedentary life and luxurious education, are the chief causes of all the evils which women suffer during pregnancy and labour. Keep children therefore out of doors, in constant exercise; allow them a full but plain and simple diet; and when grown up to young women, let them live more agreeably to nature, let them avoid late hours and crowded rooms, indulgence in soft beds, and luxurious diet; let them walk, ride and dance." If sounder doctrines than these exist in the present Year of Grace, I am unfamiliar with them.

Examples of obstetric erudition abound in this small book of Samuel Bard, and the reader will not be disappointed in a careful perusal of his work.

The author of America's first work on obstetrics was an illustrious son of an illustrious father, Dr. John Bard, who is known to us as a famous New York physician, an intimate of Franklin and Washington and the first observer in the New World to report a case of extra-uterine pregnancy. Ford has given us a pen portrait of him in his recent *Washington and His Associates*. He writes, "Dr. John Bard, the fashionable doctor of his day, who attended Washington through the severe illness which laid him up for six weeks early in his administration, habitually wore a cocked hat and a scarlet coat, his hands resting upon a massive cane as he drove about in a pony phaeton."

Samuel Bard was born in Philadelphia, April 1, 1742. Four years later the family removed to New York City, where his father had been urged to establish himself by Benjamin Franklin. Here, after attending grammar school, Samuel Bard entered King's College at fourteen years. While still pursuing his classical studies, his attention was turned to medical subjects, and he also studied with his father.

At the completion of his collegiate course, it was decided that he should go to Edinburgh for his degree. At that time, the two great centers of medical learning were Leyden and Edinburgh, and in the latter place Cullen and his associates were rapidly placing the school in the foremost position. In September, 1761, Bard embarked from New York only to be captured three weeks later by a French privateer. England and France were then at war, and as a prisoner of war

he was confined five months in a castle at Bayonne. Fortunately, his father's friend, Franklin, was residing in London and was able to obtain his release.

He at once proceeded to London where, at the recommendation of Fothergill, he went to St. Thomas' Hospital as assistant to Alexander Russell. After six months, he left for Edinburgh and placed himself under the galaxy of talent that then flourished in that city. Robertson, the historian, was at the head of the university and Rutherford, Whyte, the two Munros, Cullen, Hope, Ferguson, Gregory and Blair were among its teachers. Cullen particularly delighted young Bard, who declared he could "listen to him for three hours instead of one."

It is interesting to read a record of a medical student's activities at that time. Samuel Bard in a letter has preserved for us such a document. "My day in general," he writes, "is thus spent; from seven to half after ten I am present employed in the mathematics, which will soon however be changed for professional reading and the examination of my notes; then dress and am by eleven at College, attending Professor Ferguson until twelve; from that hour until one at the hospital, from one till two with Dr. Cullen, from two to three I allow to dinner, from three to four with Munro in anatomy, from four to five or half an hour after I generally spend at my flute and taking tea either at a friend's room or with a friend in my own; after this I retire to my study and spend from that time until eleven o'clock in correcting my notes and in general reading." Another letter which surely gratified his father reads, "Last week, the judges for the annual medal given by the professor of botany of this University, examined the hortus siccus of the candidates and I have the pleasure to acquaint you decided in my favor."

Samuel Bard graduated from Edinburgh in 1765, after having defended and published his thesis "*de viribus opii*." From Edinburgh he went to London, remaining ten months before embarking for his native land.

One or two facts concerning medical education are pertinent. Bard's education abroad had cost his father over one thousand pounds, and although there were said to be about 3,500 physicians all told in the American Colonies at that time, probably less than 400 had medical degrees. Samuel Bard therefore received what was, for that time, a luxurious education.

Morgan, Shippen and their associates in Philadelphia had from the first interested Samuel Bard. While a student in Europe, he had written to his father concerning the establishment of a medical school in New York. Within a year after his return, an organization was effected and united to King's College. His associates were Clossy, Jones, Middleton, Smith and Tennant. Bard himself was chosen to the chair of Theory and Practice of Physic. He was then in his

twenty-eighth year. Medical degrees were first conferred by this school in 1769.

When the trustees of Columbia College annexed the faculty of physic to that institution in 1792, Dr. Bard was continued as Professor of the Theory and Practice of Medicine and was appointed dean of the faculty. The establishment of the City Library and the New York Dispensary was chiefly due to his efforts.

In 1795, Bard took David Hosack into partnership and three years later he relinquished his practice in New York and removed to Hyde Park, New Jersey. His retirement could not be said to be complete, however, for at various times he resumed for short periods his practice in the city, especially when Hosack was absent from town. Soon after Dr. Bard became a resident in the country, his love of agricultural pursuits led him to form a county society devoted to those interests and he was elected its first president. At a later date, when Colonel Humphreys became interested in the introduction of merino sheep into the United States, Bard entered into that speculation and even published a book, *The Shepherd's Guide*, dealing with the difficulties of sheep raising. Shortly after retiring into the country, Samuel Bard contemplated the publication of a treatise on obstetrics. His reputation as an accoucheur had been preeminent, and it was a subject which interested him perhaps more than any other branch of medicine. In the year 1807 appeared the first of the five editions of this work. Other subjects which were well served from his pen were "Yellow Fever," in the Transactions of the College of Physicians in Philadelphia, and "Medical Education," New York, 1819. As evidence of his interest in community life, he practically founded the Church of St. James at Hyde Park in 1811. In 1816, Princeton College conferred upon him the honorary degree of Doctor of Laws. Dr. Bard was a profoundly religious individual, and his letters, many of which survive, show much evidence of this part of his character. Samuel Bard died on the twenty-fifth of May, 1821, at the age of seventy-nine. His death occurred within twenty-four hours of that of his wife, with whom he had lived fifty-six years. In a brief survey of the life of Samuel Bard, one is impressed with its great usefulness. In whatever field his interest turned, this interest was deep and thorough, and he was not satisfied until he actually contributed to the welfare of that pursuit.

Among his notable medical contributions should be mentioned his essay on "Diphtheria in skin, mucous membrane and larynx," the importance of which publication has been emphasized by Dr. Abraham Jacobi. His experiments in horticulture and his contributions to that subject are noteworthy. In the field of obstetrics, however, he will always be remembered not alone because of his authorship of the first book

in America on that subject, but because that publication was a greatly influential and noteworthy undertaking.

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NEW HAVEN HOSPITAL.

Epstein, H. J.: The Impatient Obstetrician in Our Impatient Era. M. J. & Record 131: 133, 1930.

Let Nature take her time, why hurry? There is no rapid transit road in the proper practice of obstetrics. These are the paramount sentences in this concise summary of obstetrics.

In eclampsia no forcible dilatation of the cervix, followed by version and extraction, with the usual death of the child and the endangering of the life of the mother, but conservative, proper use of morphine and chloral hydrate to control convulsions which often will obviate cesarean section or other extreme measures.

Pituitrin injections with artificial rupture of membranes result in many unnecessary stillbirths, intracranial hemorrhages of the newborn and occasionally a ruptured uterus.

High forceps deliveries should be relegated to the Dark Ages. Mid forceps deliveries only ought to be used when there is fetal distress. Nature, otherwise given a chance will mould the head and soften the parts for a normal delivery. Morphine and rest are proper procedures for atony of the uterus and maternal exhaustion. The brutal so-called prophylactic forceps has increased the stillbirths and the maternal morbidity.

Version and extraction are proper only in transverse presentation, prolapsed cord, and partial placenta previa with a fully dilated cervix.

Occipitoposterior presentation has created too much fright among obstetricians with its resultant operation or instrumental delivery. Time and patience will here accomplish better results without interference. In rare cases where there is fetal distress the Kielland forceps should be used.

Breech or podalic presentation has tempted too many obstetricians to do something. The delivery should not be interfered with until the breech has spontaneously come through the vulvar orifice. Then and only then, the obstetrician is to render "manual help" for the delivery of the upper extremities and the after-coming head.

In the case of twins, the delivery of the second baby is usually rushed along in a most rapid manner. Why hurry?

Third state of labor with many physicians assumes the character of a rapid dismissal stage. Most of the placentas are expelled spontaneously after separation from the uterine wall. Should it, however, not be expelled though separated, as evidenced by the rising of the well contracted uterus above the umbilicus, then and only then is the proper time to help the expulsion.

WM. C. HENSKE.

Society Transactions

THE AMERICAN GYNECOLOGICAL SOCIETY

FIFTY-SIXTH ANNUAL MEETING

Hot Springs, Va.

MAY 18, 19, AND 20, 1931

(Concluding Installment)

14. **The Results of the Rabbit Ovulation Test in the Diagnosis of Pregnancy**, by Drs. Karl M. Wilson and George W. Corner, (by invitation), Rochester, N. Y. (See page 513, October, 1931, issue.)

DISCUSSION

DR. MAXWELL LAPHAM, PHILADELPHIA, PA.—The technic advocated is a definite improvement over that of the Aschheim-Zondek test, both in its simplicity and ease of reading the results. It is not a highly specialized laboratory test because the reaction is macroscopic in every case.

Although Dr. Wilson has had very good results with the technic of injecting only 5 c.c. of urine and operating upon the rabbit at the end of twelve to eighteen hours, we believe that there are certain to be errors in this technic especially in a case of early pregnancy when there will not be a great quantity of the hormone and the rabbit may not react to so small an amount. We must also bear in mind that all rabbits do not ovulate in twelve hours, so that the very earliest time a rabbit should be examined would be twenty-four hours after the injection.

If, for any reason, an emergency arises such as a suspected ectopic pregnancy, two rabbits may be injected at the same time, killing one at the end of eighteen hours. If the reaction is positive, one may proceed with the treatment of the patient. However, if the first rabbit gives a negative result, the second rabbit injected for forty-eight hours can be carried along and no time is wasted in getting a true reading.

I had a very interesting case about two months ago, of a woman who came to the clinic with the uterus the size of a four months' pregnancy but who had only missed two periods. She was bleeding quite profusely at the time of admission. I carried out a pregnancy test which was positive, and because of the symptoms an evacuation of the uterus was done. The laboratory findings confirmed the diagnosis of hydatid mole. She remained in the hospital ten days, at the end of which time bleeding had stopped and the uterus had involuted fairly well. At the end of a second ten days she came back with the symptom of bleeding again. A second pregnancy test was done, and found to be still positive. A second curettage was done and a pathologic diagnosis of chorionepithelioma was made. A panhysterectomy was then done and I am about to do a third pregnancy test to see if there has been any metastasis. In such cases this test seems to be an extremely valuable one.

DR. WILLIAM A. SCOTT, TORONTO, CANADA.—The economic factor was the one that deterred us from adopting the rabbit as a routine method. We use five mice which cost approximately twenty-five cents apiece. Rabbits would cost approximately \$1.50. They have to be isolated for five or six weeks during which time

they are fed, and they eat considerably more than mice, so that the cost of the service to the hospital is going to be considerably more using rabbits as a routine. In those cases where a rapid result is desired we would feel that the urgency would demand that we use more than one rabbit because of the possibility of the toxicity of the urine. It is true that rabbits are not so susceptible as mice because on two occasions at least we have had the whole batch of mice killed by a urine that was toxic, but with the present technic we do not encounter that difficulty so often.

We are using the original test and are quite satisfied with it. Dr. Wilson spoke of its value in hydatid mole. A young woman in her first pregnancy last August had a hydatid mole removed at another hospital and then came to our hospital and was curetted. There were some remains of the mole and it was not suspicious of malignancy. She went from November to March with a history of having bled once every week during the interval. There was an enlarged, soft, retroverted uterus and we were highly suspicious of malignancy. A negative Aschheim-Zondek test relieved our minds and the symptoms ceased after another curettage and correction of the retroversion. In those cases where we suspect chorionepithelioma not only do we do the ordinary test but are also doing the test with highly diluted urine, possibly running several batches through and diluting the urine more with each batch. I can see that the rabbit test would be more useful than an ordinary mouse test after pregnancy is terminated because a negative result is obtained at the end of twenty-six to twenty-eight hours. With mice it is between two and three times that maximum length of time. It might be of value especially in a differentiation between a complete and an incomplete abortion.

DR. WILLIAM C. DANFORTH, EVANSTON, ILL.—The application of the modified Aschheim-Zondek Test in 400 consecutive cases at our hospital has demonstrated its value as a practical diagnostic procedure with an accuracy of 98.6 per cent. The original technic has been changed in the following manner with the view of increasing the simplicity and accuracy of the test:

(1) The use of one female rabbit eighteen to twenty weeks of age; (2) restriction of fluids twelve hours preceding the test; (3) filtration of each specimen of urine; (4) one intravenous injection of 12 to 14 c.c. of urine; (5) autopsy at forty to forty-eight hours.

The accuracy of the test depends to a great extent upon its limitations. A number of the cases represented in the present series indicate rather definitely that the hormone upon which the test is dependent, appears in the urine approximately three weeks following the intercourse responsible for the pregnancy. In view of this fact, it has been found possible to obtain a positive reaction in some instances even before a menstrual period has been missed.

In several other instances negative reactions have been obtained as much as five days following a missed period, even though the patient has shown by later tests to be pregnant. This demonstrates the necessity of a careful consideration of the history in each instance, and repetition of the test in cases where the above possibility exists. In other words, these facts indicate that when the pregnancy occurs immediately following a menstrual period a positive reaction may be obtained prior to the date at which the next menstrual period should appear, while if the pregnancy occurs immediately preceding a menstrual period, the reaction may not appear until a week or two following the missed period.

In the case of abortion, missed abortion, ruptured ectopic pregnancy, hydatidiform mole and chorionepithelioma, a careful consideration of the history and clinical findings is absolutely necessary for a correct interpretation of the result of the test, and lack of their consideration may lead to serious error.

It has been found that following complete evacuation of the uterus, the reaction may disappear within twenty-four hours. With incomplete evacuation of the uterus,

as in incomplete abortion, missed abortion, and ruptured ectopic pregnancy, the reaction may persist as long as a month, providing circulatory contact is maintained. On the other hand, it has been demonstrated that in the case of incomplete or missed abortion, placental tissue and even the fetus may be retained four to six weeks after the reaction has disappeared.

DR. ARTHUR H. CURTIS, CHICAGO, ILL.—The influence of living fetal tissues upon the maternal organism, in the presence of a dead fetus or when a fetus has been passed, is of interest not only in connection with a positive Aschheim-Zondek test but in some other respects. I saw rather recently a patient who had passed a hydatid mole two years ago. There had been no subsequent pregnancy. The patient was in the hands of another doctor; tests were made. At the time of passage of the mole a study of curetted material and of the fetal tissues failed to reveal a malignancy, but suddenly, shortly before consulting with me, she developed unmistakable signs of chorionepithelioma. It was an excellent opportunity for me to search for those evidences of pregnancy which might be ascribable to fetal tissues other than a fetus. This patient exhibited the best developed positive Hegar sign I have ever encountered. The patient died two weeks later, without operation. The necropsy revealed generalized chorionepithelioma, and again a strongly positive Hegar sign was evident.

DR. N. SPROAT HEANEY, CHICAGO, ILL.—During the last four years the department of pathology at the Presbyterian Hospital has been very much interested in operations upon rabbits, particularly through the work of Allen in grafting endometrium and ovarian tissue into the eye. Through this experience we have learned that in spite of precautions one may meet with pitfalls in any test which requires certification as to the genital condition of the rabbit. You have noticed in the discussions many conditions which must be fulfilled before dependence can be placed upon this test. Priest, working in our laboratory, has modified this test in a very important way. A rabbit of any age over eighteen to twenty weeks is used for the test. Before giving the suspect urine, the rabbit is operated upon and the condition of the genitalia definitely established. Both surfaces of each ovary are sketched, indicating any ripening or atretic follicles which may be present. The suspect urine is then given to the rabbit through an ear vein and the rabbit is then operated upon for a second time in from eighteen to twenty-four hours. Priest, by almost hourly observations, has determined that ovulation, if it occurs, will be complete in eighteen hours. It is, therefore, not necessary to wait longer than this to determine the result. As the result depends upon the quantity of hormone present in the urine even slight changes are important. By making a sketch before the rabbit is tested these slight changes may be noted. In a recent case consent to operation in a suspected case of ectopic pregnancy was obtained by getting a positive rabbit test twenty-four hours after the patient entered the hospital, when, if the Aschheim-Zondek test had been depended upon, consent could not have been obtained until after the tube had probably ruptured.

DR. FREDERICK J. TAUSSIG, St. Louis, Mo.—Dr. Heaney's illustration of a case in which speed of diagnosis was necessary is certainly an exceptional one and Dr. Scott's remarks were very much to the point along that line. Dr. Wilson's work is very interesting but it is still experimental. We have not as yet enough cases really to estimate the accuracy of this test, whereas the original Aschheim-Zondek test made with mice has been done so many thousands of times that we really have it as a basis for reliable laboratory report. The fact that in this mouse test five or six animals are used, and while some may be negative, a single positive establishes the diagnosis, indicates the great advantage of multiple animals for this test.

In regard to missed abortions, I have two cases in which I found the test of great value. The report came back first positive, then two or three weeks later was negative, enabling me to make the diagnosis of fetal death relatively early. These cases present considerable diagnostic difficulty. The sooner the patient knows there is no further hope for the continuation of pregnancy the better for her.

DR. FRED L. ADAIR, CHICAGO, ILL.—I have tried mice at first and found a considerable mortality, then began to use young rats. At first we used immature female rats, with the subcutaneous injection, and then intraperitoneal injections. We have also used the male rats, usually one for control and two for the injection. The results compared quite closely in both male and female. We seemed to get equal accuracy, as far as the negative and positive results were concerned, in both sexes, which is of considerable advantage, because you can use both of them from the colony.

One other point I would like to make. It has been stated that the results are 100 per cent accurate. We have not found it quite so conclusive inasmuch as we have at least two cases with an error, one case in which we got a positive test and could find no evidence of pregnancy and have as yet found none; and the other in a woman in early pregnancy for whom we had three negative tests and ultimately a positive test. I think we should bear in mind the possibility of error in a crucial case.

DR. OTTO H. SCHWARZ, St. Louis, Mo.—Dr. Brown, on my service in St. Louis, has been using rabbits for his tests and he has used serum intravenously, about $3\frac{1}{2}$ c.c. He observes the rabbits between thirty-six and forty hours feeling that the reaction at that time is most striking. His results are entirely comparable to those presented by Dr. Wilson.

DR. DOUGLAS P. MURPHY, PHILADELPHIA.—At the University of Pennsylvania we are using the Friedman test for pregnancy in a study of the amount of sex hormone which is to be found in the urine of women who give birth prematurely. We believe that information upon this point may throw some light upon the cause of premature birth, not explainable upon other grounds.

Adult female rabbits, which are in heat are employed. To secure this condition the animal is allowed to have a litter, which is immediately removed. The animal is injected with an alcoholic extract of the urine of the patient. Using this method it has been found possible to secure a positive test, by the use of as small a dose of extract as $\frac{1}{8}$ of a c.c. The latter is made up to represent $\frac{1}{4}$ of a c.c. of the patient's urine. Within twenty-four hours of the time of injection the result can be known. If the test is positive, inspection of the ovary will reveal a point of rupture upon the surface of one or more of the follicles, at which point ovulation has taken place. Using this technic it is possible to carry out the test, by employing only a small amount of material, and the result can be learned very soon after the injection has been made. From all standpoints it appears to be a very satisfactory method of carrying on the test.

DR. FRANK W. LYNCH, SAN FRANCISCO, CAL.—Eberson, in the University of California, for some time has been working on a modification of the Aschheim-Zondek test in rats. Instead of using 1 or 2 c.c. of urine, he uses 8 ounces or more, and extracts the hormones from the entire amount with alcohol. This residue is injected into two rats and the test is completed inside of forty-eight hours. His series is now more than 200 cases and shows an extremely high percentage of positive cases. Elsewhere he has printed a preliminary report. We have been trying to have him limit his tests to very early cases to aid in the earliest diagnoses, in which group he appears to be extremely successful. The method as I see it has

only the objection that it uses large amounts of alcohol although I understand this can be recovered by redistilling.

DR. WILSON (closing).—In our own series we had two negative reactions in early pregnancies which later became positive. It might be of value to inject two rabbits at the same time, giving one perhaps a larger dose and waiting a longer time before exploring it. When the first is explored, if positive you have your answer, no harm is done and the other animal is not needed. In the presence of a negative reaction in the first one, the second one either confirms or denies it when explored later (twenty-four hours).

As far as the Aschheim-Zondek reaction is concerned, many thousands of observations have been made and I think its value has been very well assessed. I think the time necessary for obtaining an answer is the chief objection. As Dr. Scott pointed out, there are other conditions too in which a positive reaction may be obtained. This procedure also is not 100 per cent accurate. That is obvious. We have not as yet had the opportunity to observe some of these other conditions mentioned by Dr. Scott but, after all, of course our series is small. The sum total of all the series published on this procedure are not as yet enough to fully assess its value but we have found it reasonably accurate, practically speaking about 97 per cent accurate, and its great advantage, of course, is the short time necessary for the reading of the test.

I was interested in hearing those observations on chorionepithelioma. Our case of hydatidiform mole we thought might be one and it did indicate, of course, that there had been small fragments left behind, not sufficient to give a positive reading at first, but which developed to some extent and in which the reaction did become positive afterward. We found fetal tissue microscopically, but not a chorionepithelioma.

With regard to economy, I did not emphasize this as an economical procedure at all. You must keep the animal isolated for at least a month before using. To do one test would be a very expensive matter. If you would like to know the cost, we estimate in mass production, so to speak, that each test costs about \$5.00, so it does require a little financial consideration if you are going to do a large number of them.

15. The Morphology of Menstrual Blood and Its Diagnostic Value, by Dr. Samuel H. Geist, New York, N. Y. (For original article see page 532, October, 1931, issue.)

DISCUSSION

DR. CAREY CULBERTSON, CHICAGO, ILL.—The points in Dr. Geist's remarks that might be emphasized are first of all, the question of secretory activity shown in the epithelial cells. I would expect by high power examination of these cells to find some evidences of that still present in the debris on the first day of menstruation.

Another point is the presence of the vaginal epithelium in this material. It is a question in my mind how much that gives evidence of menstrual blood. There are so many other factors that are continually present to bring about exfoliation, such as ordinary leucorrhea. Finally I regard it as altogether misleading, to say that a bit of discharged tissue from the uterus is decidua. I am satisfied that there is relatively little difference between decidua menstrualis and decidua gestations. I would hesitate very much to say that a given piece of tissue represented pregnant decidua and not merely pregravid decidua. In other words, I think we should still adhere in the diagnosis of pregnancy to the finding of fetal elements.

DR. EMIL NOVAK, BALTIMORE, MD.—Dr. Geist's study is apparently based on the premise, which I think is justified, that the only condition in which we find desquamation of the endometrium is normal menstruation, excluding of course the destructive changes like cancer, with which we are not concerned at present. As a diagnostic procedure his method must, of course, have a limited field of application, as he doubtless himself feels. From a differential standpoint the finding of small bits of desquamated tissue may give us a clue to the intrauterine condition, but a far more comprehensive idea can be commonly obtained by a simple diagnostic curettage. The latter is, of course, an operative procedure, but a very simple one and the knowledge which it yields, when indicated, justifies its employment.

In the interpretation of desquamated material we must, of course, exercise the same care that we would in the interpretation of material obtained by curetting. For example, the findings of a quiescent type of endometrium would not by any means rule out the possibility of an extruterine pregnancy, because as a matter of fact it is this type of endometrium which we most often find in such cases. If the tubal pregnancy is still progressing, i.e., if the trophoblast is still living and active, we would expect to find real decidua, but in this stage there is usually little or no uterine bleeding, so that curettage would be an unwise procedure.

It is not at all surprising to find evidence of secretions in the desquamated tissue, for during the first day or two of menstruation the whole compacta and a great deal of the spongiosa are thrown off, and the gland epithelium may well show abundant evidence of secretion. When we were studying the histology of the menstruating uterus some years ago we made use of a method somewhat like Dr. Geist's. Women in the dispensary were given kettles of formalin, and were directed to place the menstrual napkins at once into these vessels. A study was then made for bits of tissue, but only small amounts were found, presumably because of the rapid degeneration and autolysis which takes place.

Finally, I was interested in Dr. Geist's observations on cases of hyperplasia, because we likewise, in the study of the entire uterus of patients with hyperplasia, found the surface to be perfectly intact. I have not been able to convince myself that the bleeding is due, as Schroeder states, to small localized areas of necrosis, and I firmly believe that the important factor is one which increases the permeability of the blood vessels so that extensive bleeding may occur even with an intact surface.

DR. OTTO H. SCHWARZ, ST. LOUIS, MO.—I was interested in the section that Dr. Geist showed from a case of dysmenorrhea. I wonder if he has noticed whether there was any increase in the eosinophiles. Dr. Smith of Washington University has been studying a good many cases of dysmenorrhea and he has followed Duke's suggestion as regards the relation of allergy to essential dysmenorrhea. He has tested a good number of these patients and has found them sensitive to certain food and other substances; by withholding these substances from their diet, many of these patients markedly improved. In some instances the results were most striking. I should like to ask Dr. Geist to check this point if he has not done so already, because it may be of some value along this line. Eosinophiles have been found in large numbers in nasal conditions due to allergy. From Smith's observations I would suggest that they might also be demonstrated in the endometrium in cases of dysmenorrhea.

DR. KARL H. MARTZLOFF, PORTLAND, OREGON.—I would like to ask whether these endometrial fragments are found in fresh preparations as well as in fixed specimens? I think also one should recognize two phases in the history of menstruation. The first is the history of bleeding which the patient always notices and which she calls the first day of menstruation. The other phase is, I think,

not so generally recognized and might be termed the occult phase. Women generally begin to bleed between twelve and twenty-four hours before they are cognizant of their blood loss. I have made several such observations on women who came in for examination and noticed with the colposcope or the naked eye the discharge of blood from the external os of the cervix and on inquiry found they were just about ready to menstruate. From twelve to twenty-four hours after this observation of occult bleeding the macroscopic bleeding occurred.

Dr. Novak and Dr. Culbertson both brought out the question of the decidua-like reaction in some of this endometrium, and Dr. Geist suggested that it might be a factor in the causation of some types of dysmenorrhea. I rather question the logic of that inference for the reason that one does occasionally see in the uterine curettings from individuals who are curetted for reasons other than dysmenorrhea, an interglandular stroma that is very suggestive of decidual reaction.

DR. GEIST (closing).—Dr. Culbertson mentioned the fact that the utilization of the presence of vaginal epithelium for diagnosis was not sufficient. I am sorry that I did not make myself more clear. I had no intention of implying that this finding was sufficiently characteristic to warrant a diagnosis. It is practically a 100 per cent finding but it occurs in so many other conditions that we do not use it as a definite diagnostic sign, only as an additional aid. We use only the presence of endometrium as a means of identifying the fluid.

I forgot to mention that in 9 per cent of cases that showed no endometrium, we believe the reason we were not able to recover endometrium was that either the material was insufficient or not properly examined, or that these cases fell in the group that Heape and Corner subsequently described in monkeys who menstruate without any desquamation whatever.

The advantage of the diagnostic significance of this procedure over that of curettage is that this examination is a simple procedure. It takes twenty-four hours and is associated with an operative intervention or risk. If it gives no information one may always have recourse to curettage.

In reference to the question of the endometrium found in ectopic pregnancy, in our experience with the investigation of vaginal blood in ectopic pregnancy, we never found endometrium in the vaginal blood associated with ectopic pregnancy that in any way represented the condition of a menstruating uterus. Undoubtedly in the uterus we may have a resting mucosa with an ectopic pregnancy late in the pregnancy but the desquamation that takes place in ectopic pregnancy is the desquamation from the decidual part of the endometrium and once that is completed the remaining or regenerating uterine mucosa does not further exfoliate. For that reason when we find endometrium in the vaginal blood we can safely say that there is no ectopic pregnancy present.

We have not studied the question of eosinophilia in these fragments. We have found many lymphocytes but we have not investigated the differential cell count.

The examinations were made in fresh material and immediately fixed. The unfixed fresh material does not lend itself to examination.

16. **Reradiations in the Radium Therapy of Carcinoma of the Cervix Uteri**, by Drs. George Gray Ward and Lilian K. P. Farrar, New York, N. Y. (Paper read by Dr. Ward.) See page 543, October issue.)
17. **A Five to Fifteen Year Follow-Up Study of One Hundred Ninety-Two Cervical Cancers**, by Dr. Frank W. Lynch, San Francisco, Calif. (See page 550, October issue.)

18. **Conclusions From a Study of Five-Year Cures in a Series of 121 Cases of Carcinoma of the Cervix Uteri**, by Dr. Harry S. Crossen, St. Louis, Mo. (See page 559, October issue.)

DISCUSSION

DR. WILLIAM P. HEALY, NEW YORK.—With regard to Dr. Ward's communication, I think it is unfortunate that he uses the title re-treatment because after all he is speaking of treatment of recurrences and not reradiation. Therefore, we are not dealing at all with the question of whether cancer is or is not resistant to reradiation. As a matter of fact, it is resistant; that is an established scientific fact and Heyman definitely makes the statement that you cannot advantageously reradiate cervical cancer that has been once adequately irradiated. It would be helpful to know whether his re-treatments were in early, borderline or advanced cases.

I would like to criticize the use of the word "test" dose. Dr. Ward stated that his test dose ran from 2,400 to 4,800 mg. hrs. Such doses of radium properly applied to an early cancer will cure it, but if it is not sufficient the re-treatments that become necessary are for adequately treated disease, and if it responds to the re-treatment, it is an indication that it was treated inadequately in the beginning. Treatment two years afterward is not a re-treatment of the original disease. Fifty per cent of Dr. Ward's cases required re-treatment; 26.5 per cent of those cases survived five or more years. That is exactly 13.25 per cent of his original number of cases. In all of our advanced cases, with radiation therapy, 14 per cent will live five or more years.

As an indication of how frequently re-treatment is utilized, I went over 1,574 cases at the Memorial Hospital from 1918 to 1930 inclusive and in our early cases 10 had re-treatments. Of the borderline cases, 26; and of the advanced cases, 144, making a total of 180 cases out of 1,574. Only one of those 180 cases survived any length of time after the re-treatment. The others died within six months to a year.

When you adequately treat cancer of the cervix, whether the case is early, borderline or advanced, with radium and deep roentgen-ray therapy, in the first series of treatments you will in every instance where it is going to respond, obtain complete primary healing in two months. If you have not obtained complete primary healing in that time with adequate radiation it is doubtful if you ever will get it.

I want to emphasize one point in regard to the method we think best in handling all cases of cancer of the cervix. We do not now treat them with radium first as we formerly did unless the case is very favorable for treatment by irradiation. If it is a very limited lesion we treat it first with vaginal applications of radium. But three out of four of our cases are advanced and are not favorable to radium treatment applied first. For about two years we have been carrying out, in all such cases preliminary deep roentgen-ray therapy and following it a week or ten days later with radium applied to the cervix, and we believe there is no doubt that it is increasing the benefit of radiation therapy.

Dr. Lynch's paper emphasizes the point that good surgical technic in early cases will give as good end-results in treatment of cancer of the cervix as can be obtained by radiation therapy. He emphasized the question of clinical grouping. Compare that in different institutions. Bowing and Fricke at The Mayo Clinic classify 2 per cent as borderline and early; Dr. Lynch 27 per cent early and borderline; and out of our 1,574 cases we group 387 or 24.5 per cent as early and borderline. That is a personal equation, but see what a difference it would make in the end-results in the early and borderline groups. I feel that the whole question hinges not upon how many early or borderline or very advanced cases we have,

but what is the salvage at the end of five years in all cases of cancer of the cervix. Dr. Lynch combined radium with operation, and said that 57.2 per cent of all his patients were still living and in good shape at the end of a year. At the Memorial Hospital with the method we carry out of roentgen-ray and radium therapy, at the end of one year, and we do not refuse anything but the most hopeless cases, 83.4 per cent of our patients are still under observation. At the end of two years Dr. Lynch's group shows 39 per cent, at our hospital 52 per cent. At the end of five years we are on the same level, 20 to 22 per cent.

It would seem, then, that the outlook for the cure of carcinoma of the cervix is not a happy one, for a study of the leading surgical and radiation statistics indicates that by either method of treatment 80 per cent of all cases seen will fail to survive five years.

The most important thing is that if you can get these cases early and treat them by roentgen-ray therapy combined with radium you may save 60 per cent for five years.

DR. FREDERICK J. TAUSSIG, St. Louis, Mo.—Dr. Healy has mentioned the difficulty of any comparison of statistics from different institutions. I think perhaps of greater value is the comparison of statistics at various periods coming from the same institution. We had an illustration of that from the report of the University of Munich. I therefore thought it might be worth while to look through the records of the Barnard Skin and Cancer Hospital which has been under the care of Dr. Gellhorn and myself since 1906. The first five years have not been included in this report. The cases from the years 1912 to 1926 were largely advanced cases because of the fact that in a cancer hospital we act as a dumping ground for other hospitals and also because we have in St. Louis a large negro population. In the follow-up work there are great difficulties owing to the large number of patients coming from southern states where vital statistics are inaccurately kept. We were thus unable to trace 75 out of 432 cases (18 per cent). During this period of fifteen years we had 432 patients treated either with radium or by operation. In the first five-year period 83 patients showed four cures, or 4.8 per cent. The following five years comprised 137 patients with 13 cures, or 9 per cent. In the last five years, we had 212 cases with 26 cures, or 12.1 per cent. This shows a gradually increasing saving of life. Our percentage in groups III and IV for the first five-year period 1912 to 1916, was 81 per cent of the total, and in the last ten years 73 per cent of the total. There were 68 of group I and group II cases in the last ten years and 21 have been cured five years or more, a curability of 38.8 per cent. Of the cured cases it is of special interest that 12 operated cases had an average of nine years free of recurrence, and 18 radium cases had an average of only seven and one-half years free of recurrence. In other words it would point to the fact that the radium cases cured five years were more apt to show a recurrence than those that were treated by operation.

During the period 1917 to 1926 we used both radium and surgery. Previous to that we had no radium. Therefore a comparison of our operative results and our radium results might be of some interest. The group I cases operated upon numbered 15 with 9 cures (60 per cent). The radiated cases of group I numbered 9 with 4 cures (44.4 per cent). In Group II cases there were 14 operated upon with 5 cures (35.7 per cent), as compared with 21 radium cases, which showed five cures (23.8 per cent). In both Group I and Group II cases our results were slightly better with surgery than with radium. I want to say that in most of these operative cases radium or x-ray was used in addition to the surgical work so that some of the credit must go to the radiation but it does seem to me that these figures point very strongly to the fact that in these Group I and Group II cases the radical

Wertheim or Schauta operations have definite value and are in our experience superior to the use of radium alone. A more detailed report of our results will be reported at a later date.

DR. WARD (closing).—I accept Dr. Healy's criticism as to the matter of the term we used. Whether he prefers the term "reradiation" or "re-treatment" is a matter of no importance to me, although I think "reradiation" more correctly expresses what we do, as "re-treatment" might mean anything. I think it may clear the point to say that in the "re-treatments" that we have been following out in the Woman's Hospital it is not to reradiate the original cancer site, which has already been taken care of, but the recurrences in the way of metastases that occur in different parts of the vaginal tract or in the margins near the original site of the disease.

Dr. Healy objected to the term "test" dose. I wish we had the ability that he has, and that the others at the Memorial Hospital have, to know exactly what dose to give for any type of cell that he examines simply by looking at it. We cannot always tell just exactly what result will come from the individual application in each case. Therefore, I still think that the term "test" dose is not a misnomer. We give practically the standardized dose and in our subsequent follow-up of the case we may feel that we did not give quite enough for that particular type of cell. Perhaps a margin of the cervix may still be active, and we will therefore give a secondary treatment at that point. However, after all, what counts is the total result, and I believe that the frequent and personal follow-up, which I do not think many clinics carry out, has enabled us to discover recurrences where they would have been missed otherwise, and to re-treat those recurrences with a saving of life. When we have for a period of eleven years a figure of 25.9 per cent salvage of the total cases treated by our technic, and 57.1 per cent of the early cases, and 17.7 per cent of the advanced cases, as shown in the audit made by statisticians, it seems to me that the proof is conclusive. We certainly have saved some cases by our frequent re-examinations and "re-treatments."

I noticed that Dr. Lynch's classification of cases as to the extent of the disease almost identically corresponds with our own percentages. We have 25.9 per cent in Groups I and II, and 74.1 per cent for Groups III and IV. So apparently we have judged the cases in a very similar way. We all agree that the Wertheim radical operation will produce the results in the early cases. The point is that everybody is not capable of doing a Wertheim operation as Dr. Lynch and some others are, and it is a very frequent observation to see patients who have had the uterus removed by the ordinary panhysterectomy, which is not giving the woman a fair show. Likewise radiation is by no means the simple thing that one would imagine from reading the advertisements in the medical press, often stating that if you will send your diagnosis of the case they will send you the right amount of radium and you can treat it as well as anybody else. We know that it requires clinical experience and judgment to understand the effects of radium and we think, therefore, that it is a dangerous thing for the general practitioner without radiologic and clinical experience to treat these cases. Just as much damage can be done by destroying tissues unnecessarily as with the radical surgical operation. The hope that we have is that with the high voltage x-ray therapy, the involvements beyond the local point of internal application of radium will be taken care of. At the Woman's Hospital we have only had the high voltage apparatus for the past two years so that we are not giving any figures therefore as to the results with the combined treatment. Regaud stated in his Liverpool address that there is no question that with the deep x-ray therapy his recent results are going to take care of the 43 per cent of gland involvement that Victor Bonney describes.

DR. LYNCH (closing).—I am not urging surgery for the treatment of cervical cancers as much as I am pleading for cancer clinics in which the subject may be properly investigated. Without much material, such studies as mine must proceed slowly. A man may spend his entire life and end up with a series so small that it is scarcely worth consideration. I feel that our series are of interest largely because our follow-up has shown us what has happened to our cases. Our results with surgery speak for themselves, yet the method is brutal and sooner or later if we are to cure cancer some method must be found which will eliminate surgery.

One must realize, however, that the sooner we standardize the treatment of cancer, the better. Our work as far as we have gone suggests that the biologic and histologic study of women with late recurrences offer the greatest field for investigation at the present time. The efficiency of our follow-up is shown by the fact that in a series of 350 cervical cancers only two have escaped. These two were followed between three and three and a half years before they were lost sight of. We have not lost a case from the follow-up for ten years. The efficiency of the follow-up for the five-year series is 99 per cent.

OBSTETRICAL SOCIETY OF PHILADELPHIA

STATED MEETING, MARCH 5, 1931

DRS. N. F. PAXSON AND H. S. RUTH presented papers on **Obstetric Anesthesia and Analgesia With Sodium-Iso-Amyl-Ethyl-Barbiturate and Nitrous-Oxide-Oxygen.** (For original article see page 90.)

DISCUSSION

DR. JOHN C. HIRST.—I find the administration of sodium amytal by mouth much easier and just as effective, and I use it as soon as the patient enters the hospital in labor: 6 grains on admission, and 6 more in an hour or two, but never more than 18 to 24 grains altogether.

I do not believe that this so-called anesthesia affects pain, but it does affect memory, its main advantages being that it lasts a long time, sufficient for any labor, does not stop the pains and has no bad effect on the baby. Its disadvantages are often extreme restlessness, and that it cannot be given to the asthenic type of patient with low blood pressure. I have used sodium amytal in a total of more than 300 cases, at first by rectum but later by mouth, reserving gas anesthesia for the actual delivery in most instances.

We stopped using it by rectum at the University Hospital Maternity after two reported series, totaling only about 80 cases, because the restlessness after rectal administration required excessive nursing attention to a much greater degree than by the oral method.

DR. HENRY S. RUTH.—Regarding the administration of sodium amytal by mouth, I have been using the drug almost routinely by this method since its introduction as a preliminary medication for general surgery. Consequently, I feel that I am thoroughly familiar with its action following the oral administration. It is my belief that it is a fallacy to employ by mouth the large doses occasionally quoted, for we cannot predetermine the tolerance of any one individual, for there are too many variable factors such as body weight, age, nervous tension, etc. We do not fear an excessive blood pressure fall with the intravenous method for we have never encountered this condition. Blood-pressure readings are always taken before and during its intravenous administration, and if a severe fall develops, the

injection is stopped immediately. Sise reports a method of dissolving ephedrin in the sodium amytal solution and injecting the two concomitantly to prevent a fall in blood pressure. With our method of intravenous administration this was not deemed necessary for the dosage employed has never caused an alarming fall.

DR. PAXSON (closing).—Giving this anesthetic intravenously has the advantage of accurate control so that complete analgesia is obtained with much less danger of restlessness. Administration by mouth is simpler, but the danger of restlessness is markedly increased and the dosage is not satisfactorily adjusted to the patient.

DR. CATHARINE MACFARLANE presented a paper entitled **Carcinoma Developing in a Myomatous Uterus After X-Ray Menopause.** (For original article see page 108.)

DISCUSSION

DR. CHARLES C. NORRIS.—In a series of about 600 cases treated by radiation in the Gynecologic Department of the University Hospital, success has followed the treatment in 94 per cent.

Myoma and carcinoma of the fundus are frequently associated and the symptoms of the latter are prone to be masked by those of the benign tumor. To prevent overlooking the carcinoma in these cases a routine diagnostic curettage should be performed, and this applies even more strongly if x-ray is employed instead of radium.

Although not absolutely conclusive, the Clark test is a valuable adjunct in the diagnosis of fundal carcinoma. This consists in cleansing the vagina and passing a sterile sound to the fundus, the point of which is then gently manipulated over the endometrium. If a friable, vascular growth such as carcinoma is present, the procedure is followed by a trickle of blood. This test may be employed in the office. I have never seen it fail when a cancer was present. It should not be used unless pregnancy can be excluded.

I have personally never observed a case of carcinoma developing in a uterus after irradiation. However, there are in the literature a few such instances, for obviously irradiation is no preventive to the subsequent development of carcinoma. After the establishment of the surgical or irradiation menopause, carcinoma has been observed to develop in extremely young women.

Most of us are in the habit of rather stressing the age factor in uterine cancers. As a matter of fact age in years is not the important point, but rather the sex age. It is the absence of the ovarian and other hormones, with the resulting senile changes in the uterus which are the predisposing factors. It is well known that the carcinoma age is lower in the tropical countries where the menopause occurs earlier.

I believe that all myoma cases which have been treated by irradiation should be kept under observation. It is my custom to have patients report for follow-up observation every three months for a period of two years.

I do not believe that the irritation following intrauterine irradiation is an important factor in the subsequent development of carcinoma. I have examined a number of uteri which have been so treated, and after two or three months it is impossible to demonstrate the site of irradiation.

DR. GEORGE E. PFAHLER.—The patient under discussion was referred to me by Dr. Ellen Brown of Chester, who had made very careful studies of the case. Her opinion was that no malignant disease was present.

She had at the time a complete study of the blood made, but the striking fact

was that the hemoglobin was down to 40. The patient refused operation. She had a fibroid of the uterus which extended to the umbilicus which we do not treat if we can avoid it because of the size: but if one has no choice, I think irradiation is better than letting the patient die, even though one does take risk of skin damage.

This patient was treated by low voltage rays, because we had no high voltage rays at that time, and because the large tumor had to be crossbarred. This accounts for considerable fibrosis present after fourteen years, and made the operation by Dr. Macfarlane more difficult. This fibrosis can generally be avoided today by the use of high voltage rays, and it can be improved because of a greater depth value.

The curettage that I did was under morphine and hyoscine. The microscopic report was negative, therefore, after twenty-four hours, we removed the radium, 150 mg. Had I been treating it on the basis of adenomatous carcinoma, I would have left it in forty-eight hours which might have prevented the further growth or the later development of this carcinoma.

The curettage being negative, we applied radium for twenty-four hours. The carcinoma was still confined to the uterus even at the operation.

Coming to the question of removal of all these uteri: there is also the possibility of development of carcinoma in the cervical stump, and if you do a complete operation you also have the possibility of carcinoma of the scar.

We have about fifteen times as many cases of carcinoma in the routine cases, as in those treated by irradiation. It would seem, therefore, that irradiation prevents development of carcinoma.

I do not believe that irradiation causes carcinoma in the deeper tissues.

DR. STEPHEN E. TRACY.—About two and one-half years ago, a patient aged sixty-three, came under observation who complained of vaginal bleeding. Examination showed a myomatous uterus irregularly enlarged to the size of a three months' pregnancy.

A diagnostic dilatation and curettement was performed. The pathologist reported there was no malignancy. As she was fat, flabby, and a poor surgical risk it was decided to use radium and she was given 1,500 mg. hours. Nine months later she returned and stated she had had vaginal bleeding for a few weeks. Examination showed the uterus had shrunk more than 50 per cent.

She was again dilated and curetted and as the tissue did not appear, macroscopically, to be malignant, she was given a second treatment of 1,500 mg. hr. of radium. Histologic examination of the tissue secured at the second curettement showed an adenocarcinoma.

The patient was not seen again for another nine months. At that time she complained of a vaginal discharge and of a distress in the pelvis, and she had some fever.

At examination the uterus was found to be cystic, enlarged and halfway to the umbilicus.

When the cervical canal was dilated a considerable quantity of purulent fluid and necrotic tissue rolled out. After the fever subsided and she was in better condition, operation was recommended and was promptly refused.

DR. WILLIAM R. NICHOLSON.—The comparative rarity of carcinoma developing in the cervix after supravaginal hysterectomy, and further, the fact that if the cervix stump is coned out in a hysterectomy for uterine myoma and then subsequently, after the woman has convalesced, obliterates the canal from below with the cautery, one practically does away with any likelihood of subsequent carcinomatous development. The advantage of this procedure over the panhysterectomy as a routine for fibroid is very evident in that the mortality is decidedly less and

in addition to that the attachments of the uterosacral ligaments remain uninjured, thus preventing the possibility of vaginal prolapse.

It seems to me that there can be no question that the operation for myoma of the uterus is far better than the use of radium or x-ray since the mortality is low and the late results good. In any event, it is very definitely my opinion that no x-ray or radium should be used therapeutically in fibroids larger than a two months' pregnancy.

DR. R. W. MOHLER read a paper on **Breech Presentations**. (For original article see page 61.)

DRS. P. B. BLAND, A. FIRST AND P. ROEDER presented a paper entitled **A Comparative Study of the Aschheim-Zondek and Mazer-Hoffman Tests for Early Pregnancy**. (For original article see page 83.)

DISCUSSION

DR. CHARLES MAZER.—I have no criticism to offer with the exception as to the occurrence of ovarian hyperfunction. The consensus of opinion is that the hyperfunctional states of the ovaries do not exist. The occasional finding of an excess of female sex hormone in the urine of women suffering from functional sterility is, in my opinion, due to the inability of the endometrium to concentrate the hormone in the absence of the lutein phase of the ovarian cycle.

Hyperfunctional states of the pituitary gland, on the other hand, are recognized entities. Fluhmann has shown that 40 per cent of menopausal and castrated women have an excess of anterior pituitary sex hormone in the circulating blood. I have demonstrated an excess of the hormone in 50 per cent of women suffering from primary ovarian failure. In these women the kidneys often eliminate a sufficient quantity of the hormone to render a positive reaction in the nonpregnant state.

Numerous European investigators found the Aschheim-Zondek test correct in 98 per cent. Brouha and his coworkers, however, found the test subject to a 40 per cent element of error and therefore modified the test by employing male instead of female mice.

JOINT MEETING OF THE CHICAGO GYNECOLOGICAL AND CHICAGO UROLOGICAL SOCIETIES

FEBRUARY 26, 1931

SYMPOSIUM ON STERILITY

DR. HENRY SCHMITZ presented a paper entitled, **Some Notes on Sterility Due to Obstruction in the Uterine Tubes**. (For original article, see page 47.)

DR. VICTOR D. LESPINASSE presented a paper entitled, **Sterility in the Male Due to (a) Deficiency of Spermatozoa; (b) Obstruction of the Passages**.

DISCUSSION

DR. N. S. HEANEY.—It would be interesting to know in connection with Dr. Schmitz' operation how many patients failed to become pregnant promptly and how many started to use contraceptives right after operation.

I believe I have only operated upon two patients for tubal obstruction solely because of sterility. One of those patients had a chronic tuberculosis which could not be diagnosed by the history. The tubes were tuberculous. The tubes were left open but the response to the patency test was negative. I have done Touffier's operation of transplanting the ovary into the uterus.

DR. IRVING F. STEIN.—One or two minor points bear correction. Lipiodol is not a solution of iodine in oil, but a chemical compound of iodine. Poppy seed oil contains 40 per cent of iodine by volume. One point about pneumoperitoneum is that it requires only about a liter of gas and the discomfort is very transient. In less than an hour many patients can get up and go home after transabdominal or transuterine pneumoperitoneum. There is no cardiac disturbance with a liter of gas. I can say this from an experience of 500 pneumoperitoneums.

The term infantile uterus is not a good one to use. Many patients who have been described as having infantile uteri and later became pregnant did not have an infantile but an immature uterus that developed later through stimulation or through natural causes. We are just in the midst of studying a series of 300 cases of patients who have come to us because they were childless. We found among them a number who were not sterile but were not fruitful. I have not come to the point of the number of pregnancies nor is that important for this evening's meeting. We had 44 cases that were found to have a definite tubal obstruction on testing both with gas and lipiodol. Nine patients were operated upon for tubal obstruction. In four salpingostomy was performed, in two hysterectomy, in two myomectomy, and in one salpingectomy. Among four salpingostomies there were two pregnancies. I do not mean we have 50 per cent success, because with a series of four any estimation of percentage is ridiculous.

DR. J. P. GREENHILL.—Dr. Schmitz made the statement that pelvic infections are self-limited. I think we as gynecologists should bear that in mind. Last year a report came from Stockholm of 700 cases of salpingitis in which only 25 per cent of the patients had not become pregnant. That behooves us to be very careful in removing structures.

Dr. Schmitz said that 75 per cent of female pelvic infections are due to gonorrhea, about 20 per cent to sepsis, and about 5 per cent to tuberculosis. Some years ago I studied tuberculosis of the female genital tract and found 6 to 10 per cent of tubal infections due to tuberculosis. I know of only one case in the literature where a patient became pregnant after being treated for tuberculosis of the tubes proved microscopically. Most people with tuberculous salpingitis remain sterile.

Regarding the Rubin test, many feel that with this test they can accomplish all they wish for in sterility. As Dr. Stein indicated, the actual technic of the test is simple but the follow-up with x-ray and the matter of interpretation are not so simple.

I have had two cases of full-term pregnancy following salpingostomy.

I would like to ask Dr. Lespinasse if he has had many successes in injecting sperm into the uterus three to four days before menstruation. It is hardly conceivable that the injection of sperm at this time will fertilize the ovum.

DR. HARRY C. ROLNICK.—It is my impression that the treatment of male sterility still lies with the experimental laboratory. I do not mean the obstruction type, but those cases that are sometimes classified as endocrines. The researches of Oscar Riddle and of Moore at the University of Chicago are the most outstanding of all on the gonads and gonad metabolism. I think a good many males are sterile due to cross breeding or inbreeding and while normal otherwise have spermatozoa which will never develop. There are a good many others whose endocrine causes we do not quite understand. Riddle showed that a good many birds have

accessory thymus tissue that may persist and prevent full sexual development. Recently Moore in his presentation at the University of Chicago before the Biological Club described a series of experiments, which showed that the pituitary has a definite action not so much on the testes but on the accessories, the vas, prostate and vesicles, and that the pituitary prevents the development of these accessories, although the testicle is rather fully developed at birth.

Many individuals who have chronic prostatovesiculitis not of venereal origin have a definite deficiency in sperm. What that prostatovesiculitis is due to is hard to say.

The method of diagnosing the presence of sperm in the testes suggested by Huhner was aspiration of the testes. It does not appeal to me and impresses me as not being of much value.

DR. ALFRED E. JONES.—A better understanding of the subject of male sterility could be had if we considered some of the experiments which the veterinary surgeons have been doing recently. These surgeons have found out that in breeding cattle the number of pregnancies is definitely proportionate to the preponderance of the normal spermatozoa over the abnormal. This study has also been taken up by the gynecologists, especially in Europe, and has been confirmed. If this is true, then the motility which we used to think was very important will be relegated to at least second-class importance.

In the discussion of the subject of sterility the gynecologists must necessarily hold the stage at the present time, because we must confess that their results are much more definite than the results of the urologists. This is true not only because of the anatomical construction of the female genital tract but because of refinements in diagnosis, patency tests, etc. In our experience whatever success we have had has been in cases in which we were able to demonstrate pathology in the genital or urinary tract, chronic vesiculitis or prostatitis or stricture of the ureter, etc. When this was corrected and only then did we have success.

DR. CHARLES M. McKENNA.—I was interested in the etiologic factors brought out by both Dr. Schmitz and Dr. Lespinasse and especially what they had to say concerning the question of tuberculosis. At the Municipal Tuberculosis Sanitarium we had occasion to make postmortem examinations in 174 cases, during which we made a comparative study of tuberculosis of the urogenital tract in both men and women. In these 174 cases we found there was less tuberculosis in the genital tract of women than of men.

DR. SCHMITZ (closing).—As I said these methods of diagnosis described by me are only indicated when there is no palpable pathology. If there are cysts or inflamed tubes palpable in the pelvic cavity there is sufficient reason for sterility.

As to the question of tuberculosis in women, statistics collected in central Europe show that in the northern part of Europe they have 17 per cent of tuberculous salpingitis while in southern Germany they have less than 5 per cent, so I feel that the average in our patients is very nearly correct and that tuberculosis of the tubes is very frequently found. I only dwelt on the subject of sterility due to closed tubes.

DR. LESPINASSE (closing).—I would like to discuss Dr. Schmitz' comment regarding uterine spasm. I have had a very large experience in the injection of semen in the uterus. My first experience was with a relatively large catheter and a relatively large amount of semen. That woman had intense spasm. To obviate that spasm I had made some small tubes from 1 to 1½ mm. in diameter and then I found if I injected more than 15 minims, spasm was almost certain. When this work of injecting lipiodol and other solutions into the uterus came out it was inconceivable to me how that amount of material could be injected into the uterus and not cause spasm, from my previous experience with semen.

CHICAGO GYNECOLOGICAL SOCIETY

STATED MEETING MARCH 20, 1931

DR. R. A. SCOTT reported a case of **Combined Pregnancy**.

Mrs. W., aged thirty-three, was awakened at 4:00 A.M. on Dec. 26, 1929 by a severe cramp-like pain in the lower left quadrant of the abdomen. Immediately following the pain, the patient developed severe nausea and a moderate vaginal bloody discharge. One hour after the onset of the cramp-like pain, it was necessary to administer $\frac{1}{4}$ grain of morphine hypodermically. The patient was hospitalized with the tentative diagnosis of ruptured tubal pregnancy on the left side.

Previous history revealed an irregular menstruation and during the past two months a complete amenorrhea. Bilateral tenderness and pain had been present for past ten days. On two occasions during past week there was noticed a slight vaginal bleeding. The patient's general health had been good with the exception of a moderate amount of nausea.

The general examination was negative; temperature 99° F.; pulse rate 80; respirations 20. Palpation of lower quadrants of the abdomen elicited tenderness and in the left quadrant could be felt a mass which was extremely sensitive. Bimanual examination revealed an irregular soft cyst-like mass on the left side extending down into the culdesac to a point a little beyond the median line. The uterus seemed slightly enlarged and in an approximately normal position. Nothing unusual was found on the right side and the examination caused no discomfort. A moderate amount of serosanguinous vaginal discharge was noted.

Laboratory Findings.—Hb. 66 per cent, R.B.C. 3,690,000, W.B.C. 16,500. A catheterized specimen of the urine showed 1 per cent albumin, occasional granular and hyaline casts, occasional leucocytes, frequent epithelial cells.

For some unknown reason the blood pressure was not taken. Another careful bimanual examination was made on the evening of the same day, after an enema. The cystic consistency of the mass was misleading because there were no gross symptoms of internal hemorrhage with accompanying shock and rapid pulse symptomatic of a ruptured tubal pregnancy. The presence of an ovarian cyst which had twisted on its pedicle giving the symptoms and findings previously described had to be considered, bearing in mind the history of irregular menstruation. During the next four days the blood counts showed that the hemoglobin dropped from 66 per cent to 60 per cent, the R.B.C. from 3,690,000 to 3,310,000 and the W.B.C. varied between 14,900 and 16,850. Convinced that there must exist some bleeding point within the abdomen, probably the left tube, a preoperative diagnosis was made of ruptured ectopic pregnancy.

Laparotomy was performed five days following the original acute attack of pain. Midline abdominal incision revealed a uterus lying anterior, approximately the size of a two months' pregnancy, and to the left and posterior an enlarged tube with a rent in its wall near the distal end filled with blood clot. Adherent to the tube and covered with dark blood clot was a parovarian cyst approximately 4 cm. in diameter. There was also a large number of dark colored clots in the culdesac. The left fallopian tube with adherent cyst, was removed. Abdomen closed in the usual manner, no drainage. Patient made a slow but uneventful recovery.

On June 5, 1930, patient consulted an obstetrician and gave the date of the beginning of her last menstruation as October 26, 1929, which date was about two months previous to the date of her operation for a ruptured ectopic pregnancy. A normal baby was delivered following an induction of labor because of a complicating nephritis, on August 7, 1930. Baby weighed 6 pounds $8\frac{1}{2}$ ounces.

Due to the fact that the uterus was slightly enlarged, as a result of the tubal pregnancy, there was no thought given to a possible uterine pregnancy and no postoperative sedatives were given in more than normal amount to allay pain than in any surgical case. It is surprising that the uterus did not empty itself after the above operative procedure.

DR. A. F. LASH reported a case of Preeclampsia in an Abdominal Pregnancy.

N. LeF., a negress, thirty-one years of age, gravida ii, entered the Obstetrical Department of the Cook County Hospital on January 2, 1931, complaining of vaginal bleeding of five and one-half days' duration. Her last period was May 10, 1930. The pregnancy had progressed normally except for some "misery" in the lower left side of the abdomen which occurred in the latter part of June. Also in August she had a "falling of the womb" which confined her in the hospital for four days. The cervix was found prolapsed about 6 to 8 cm.

For the first time she experienced pain across the lower part of the abdomen about eighteen hours before admission.

She had one previous pregnancy only in 1921.

The well-developed and well-nourished negress had normal temperature, pulse and respirations, and generalized edema. Blood pressure 210/110. The abdomen was round, soft and elastic with no rigidity or tenderness. The pelvic mass rose to 4 fingers below the xiphoid. A small baby was palpable in the transverse presentation (Scap. R.A.). The fetal heart tones were very distinct and near the surface, having a rate of 144.

On the basis of the history a tentative diagnosis of placenta previa was made and a routine vaginal examination done to determine the source of the bleeding. The essential findings were: A long, thick, patent cervix extending down to the vaginal orifice and intimately associated with a firm mass in the culdesae which was mistaken at first for a fibroid but by intracervical digital exploration, it was found to be the retroflexed corpus.

The abdomen was again examined and no round ligaments were palpable. Therefore the diagnosis was made of abdominal pregnancy. The blood picture was normal. The Wassermann test was negative.

The operation was performed under spinal anesthesia using spiuocaine (2 c.c.). After opening the peritoneal cavity through a long lower midline incision, a large sac resembling an ovarian cyst and over which large vessels coursed, was seen. The omentum and two loops of small intestine were adherent to the sac. There was no free blood. Although I attempted to open the sac through a bloodless area, I encountered a cotelydon which was clamped with ring forceps.

A live baby was delivered weighing 5 pounds 10 ounces. The right side of the face was flattened. The cord was clamped and cut. The omentum and loops of bowels were freed. It was then found that by clamping around the base of the sac, it could be removed, separating it from the adherent corpus. Since the patient was in good condition and as there were many fibroids in the corpus a subtotal hysterectomy was performed. All clamped tissue was ligated and the vesical peritoneum was used to cover the cervical stump and the broad ligament. The abdominal wall was closed.

The postoperative course was febrile for the first twelve days, although the patient was fairly comfortable. The wound healed by primary union. Mother and child left the hospital on the twenty-fourth postoperative day. The mother's blood pressure was 120/70. When the mother was seen on February 13, in the

postnatal clinic, no palpable pelvic pathology was found. Her blood pressure was 160/90. The baby was well and growing.

The specimen consisted of a large sac whose outer surface was smooth and covered with large blood vessels. Posteriorly a part of the ampullar portion and the fimbriated end of the tube (3 cm.) was seen as well as a thickened area resembling ovarian tissue. The interior of the sac was the amniotic sac with several separated cotyledons forming the placenta as vessels from these fused to form the umbilical cord.

Microscopic sections of the sac, through free and placental parts showed decidua cells. The fallopian tube and a corpus luteum were seen in the sections through the areas described above. The decidua of the corpus uteri showed superficial necrosis. The final diagnosis was intraligamentary pregnancy secondary to tubal rupture complicated by preeclampsia.

DR. R. A. LIFVENDAHL reported a case of **Uterine Abscess, Hysterectomy, Recovery**. (See page 97.)

DR. RALPH REIS presented a specimen of **Fetal Sympody**.

DR. FRED L. ADAIR presented a paper entitled, **Syphilis of the Fetus and Newborn Infant**. (See page 111.)

DISCUSSION

DR. CHARLES S. BACON.—At the Salvation Army Hospital for the last four years, among 918 confinements, there were 46 mothers and 45 babies with positive Wassermanns, a frequency of 5 per cent. There was no doubt about the reaction because it was taken over two or three times, so all these women were considered syphilitic. Most of the women were white; perhaps one-fourth were negroes. They were all unmarried. Of the 45 babies the cord blood was positive except in one case. In that case about four months later, examination showed the blood to be positive. Four of the babies were stillborn and two died while in the hospital. They stay in the hospital generally from six weeks to three or four months. The fetal mortality was 13.3 per cent. Treatment was given as soon as the diagnosis was made after the patients came into the hospital, which was usually from the twenty-fourth to the thirty-sixth week. If the Wassermann was positive, they were put on a regular course of treatment, repeated if necessary. The babies were put on mercury and oil injections. They all did well, except the two who died.

I might say there were hardly any manifestations of syphilis in these women. In a few there were slight skin findings, but none of them would have led to the diagnosis had it not been for the Wassermann. None of the other babies showed any Wassermann reaction on the cord blood.

At the open clinic of the house cases at Grant Hospital there have been in the last five years about five cases which showed positive Wassermann. These patients generally come early and the results of treatment have been satisfactory in all cases. There were no deaths among the babies.

DR. ADAIR (closing).—I would just like to make it clear that these autopsies and results do not represent any one person's practice or clinic. We tried to secure autopsies on these newborn infants from all sources. It is more the result of the obstetric practice in the city at large than of any one clinic. It compares pretty well, relatively, with the general statistics of syphilis, 3 per cent in the whites and 23 per cent in negroes. The principal point about the presentation is

this, that syphilis still exists and unfortunately it is not productive of any good result so far as the fetus or newborn infant is concerned. There is no use treating the syphilitic infant after it is born, that is, one showing manifestations of syphilis soon after birth. The time to treat syphilis is before or during pregnancy and that means the recognition of syphilis in the potential or prospective mother.

Relative to the clinical findings and Wassermann reaction, I tried to make it clear that many of these Wassermans were not made until after we had made the autopsy. We tried to check up but we did not obtain a Wassermann in all.

The statement that the clinical evidence of syphilis was absent does not mean very much because many of these patients were indifferently observed during pregnancy and afterward. I imagine if they had been more closely observed there would have been clinical manifestations of it discovered.

BALTIMORE OBSTETRICAL AND GYNECOLOGICAL SOCIETY

STATED MEETING, JANUARY 9, 1931

DR. WILLIAM SCHUMAN read a paper entitled **Fractured Pelvis in Obstetrics**. (For original article see page 103.)

DISCUSSION

DR. C. H. PECKHAM.—It seems in order to open the discussion of Dr. Schuman's paper by reporting briefly the history of a case of pregnancy following fractured pelvis which was seen in the obstetric service of the Johns Hopkins Hospital in the summer of 1930. The patient was admitted in labor and had not been seen previously. She stated that seven years before she had been severely injured in a motor accident and was operated upon at the Mercy Hospital, where she remained for two months. On discharge, she noticed that the left leg was shorter than the right. Three years later she became pregnant and went to term. After being in labor for nineteen hours at home, she was taken to another hospital, where cesarean section was performed. The present pregnancy was uneventful. Three days prior to admission, following a fall, the membranes ruptured and there had been slight bleeding ever since. Labor set in twenty-four hours before admission and the patient had been examined vaginally several times by her family physician. Just after entering the hospital, patient had a chill, temperature rose to 103° F., and the pulse to 120. The uterus was tightly contracted about the child, which lay in R.O.T., with the head just dipping into the superior strait. Fetal heart sounds were not heard. The external pelvic measurements were: 22, 29, 30, and 17 cm. Rectal examination showed the cervix 5 cm. dilated and the pelvic cavity obliquely contracted. Immediate delivery by craniotomy was done, following which the patient had a 1000 c.c. postpartum hemorrhage necessitating tamponade of the uterus. Following the operation, the patient did badly, temperature and pulse remained elevated and death occurred on the fifth day. Intrauterine culture taken at the time of delivery showed beta hemolytic staphylococcus aureus; and the day before death, the same organism was obtained from the blood.

Autopsy permission was obtained and the pelvis was dissected out and prepared for a museum specimen. Examination of this specimen showed a greatly distorted superior strait with the entire left side of the pelvis smaller than the right, the linea terminalis measuring 11.2 cm. on the left, as compared with 12.8 cm. on the right. This shortening was almost entirely limited to the iliac portion of the terminal length, which measures 4.7 and 5.9 cm., respectively. The con-

jugata vera extended obliquely and measured 7.75 cm. The symphysis pubis was fused and its anterior surface presented a nodular appearance, evidently the result of old inflammatory changes. Just to the right of the inferior margin of the symphysis, there was a spike-like projection of bone from the anterior surface of the ramus. The left sacro-iliac joint was distinctly abnormal and around it was marked callus formation which extended over the entire posterior portion of the left iliac crest. The articular surfaces were greatly widened with the sacral portion presenting a corrugated appearance.

From the findings, it was difficult to say exactly what the original injury had been, but it appeared that there must have been a fracture of the anterior wall of the pelvis, associated with serious injury to the left sacro-iliac joint and the adjoining innominate bone. Posteriorly, there was apparently an osteitic process resulting in marked callus formation, and the deformation of the left auricular facies of the sacrum. The lack of development of the iliac portion of the left terminal length must have been considered as partly trophic, as the original injury occurred when the patient was fourteen years old, and at a time before the pelvis had attained its full development.

DR. ROBERT W. JOHNSON, JR.—There are undoubtedly a large number of fractures of the pelvis in women, chiefly resulting from automobile accidents, without associated grave complications. When women are in the child-bearing age, this factor is of extreme importance to the orthopedic surgeon who treats them. Usually, however, the displacement of the fragments is so slight, the callus formation not exuberant and when discharged the great majority seem to present no contraindications to labor. Moreover, in over ten years I have had only two cases where pelvic distortion seemed enough to require forewarning the patient of the necessity of a cesarean delivery in future pregnancies. This represents a very small percentage, well under 10 per cent of the fractures of the pelvis treated, though I have not at the moment all the figures required to make the definite percentage report at present. However, it should be the duty of the surgeon or orthopedic surgeon who treats the child-bearing woman for a fractured pelvis to insist on her acquainting the obstetrician with the fact of her previous accident, so he may be forewarned, and an x-ray check-up made prior to labor.

DR. WILLIAM S. GARDNER read a paper entitled **The Origin of Ovarian Epithelium.** (For original article see page 54.)

DISCUSSION

DR. THOMAS S. CULLEN.—The ovary usually has a smooth, flat surface, but every now and then, where there are little clefts or depressions on the surface, one finds that the surface cells tend to become cuboidal. I have frequently noticed a similar change on the surface of the fallopian tube where it was covered with loose adhesions.

In the hilum of the ovary I have occasionally found irregular spaces lined with a low or high cylindrical epithelium.

At times real miniature uterine cavities are present in the ovary, as was pointed out by my colleague, the late William Wood Russell, in 1898.

The ovary must really be regarded as an embryo factory containing nearly all the elements necessary to produce a human being. At times, however, a stimulus comes along which causes certain groups of cells to develop and produce dermoid cysts.

Department of Book Reviews

CONDUCTED BY ROBERT T. FRANK, M.D., NEW YORK

REVIEW OF NEW BOOKS

GENERAL INTEREST

This is a good book.¹ Dr. Dickinson and Miss Beam have approached the same problem as Katherine Davis and Dr. Hamilton, but from another angle. It is exceedingly interesting that their conclusions are so similar. Though the emphasis in the collection of the material has been less definitely on the psychologic side, yet there is more psychologic insight and evaluation than has been evidenced in the published attitude of any previous gynecologist.

A correct emphasis has been placed on the fact that a single photographic picture of a woman taken at one occasion will not convey as true a story, as a case history running over a number of years. In this connection, the extraordinary energy, patience and prevision of Dr. Dickinson have given to gynecologists the opportunity of studying the dynamics of a woman's sexual history, as opposed to the more static pictures with accompanying emotionally colored, faulty memories. The exposition is frankly individual and though it reflects Dr. Dickinson's lack of formal training in psychoanalysis, it reveals an instinctive grasp of its more important teachings. One may see a serial change in his attitude from the beginning to the end of his practice, a logical evolution in his breadth of view. There is no sclerosis or inspissation; to the end he is young and elastic. We must remember in evaluating this book, that it was not planned in the present form when the histories were taken. It is not a short-term investigation, but a utilization of records at hand. Thus it may seem to contain some irrelevancies. These, however, all have human interest, throw side-lights on the events, show the catholic interest of the compiler and make the data very much alive. It should be noted that there is no attempt to outline treatment although there is ample internal evidence that efficient practical therapy is not lacking in many cases. The introduction states distinctly that the volume on therapy is to follow.

Both authors are selfcritical and so almost entirely disarm any possible criticism: "One case of itself proves nothing. Each single group proves nothing in itself; the material is better understood collectively." There is a wide variety. The case histories show that even in a thousand cases we have an opportunity for an excellent cross-section of all possible variations. Dr. Dickinson's experience has included some at least of any type of case that one may expect to find.

It is important to read the foreword, introduction and entire text. The tendency in the book toward tabulation, classification and "set-up," makes for good pedagogy but has the possible danger in that it prompts perusing, skipping and jumping ahead to points of major interest, with all of the consequent possible misjudgments. One single sentence modestly placed at the end of a paragraph, may be quoted as indicative of the authors' adherence to certain psychologic truths long before they had filtered through to the profession in general. "There

¹A Thousand Marriages. Medical Study of Sex Adjustment. By Robert L. Dickinson & Lura Beam. The Williams & Wilkins Co., Baltimore, 1931.

was no incision for vaginismus." May I quote, also, an illuminating bit from the text: "The patient could not get married because she had to support her mother and she could not sleep because she was worrying about the break with her fiancé. Her body's reaction to these burdens seemed to be the painful menstruation for which she wanted relief." This alone, will align Dr. Dickinson with the viewpoint of Walthard, and indicate his very early acceptance of teachings that are modern (and evidently not so modern).

In their discussion of frigidity, the authors give an excellent description in lay terms of the concept of "distribution of libido." The following pertinent quotation demonstrates this beautifully:

"The diagnosis depends first on their knowledge and conception of the typical. Next it depends upon prolonged acquaintance with many other factors. Does the woman begin to be cold at general caresses at desire for coitus, at the excitement of preliminary caresses at intromission, at orgasm, after orgasm? If she accepts four stages but not five is that female frigidity? If there is complete sexual failure with the husband it is necessary also to know reaction to other men; if there is no responsiveness to men, it must be ascertained if there is no responsiveness to women; if there is anaesthesia to others of both sexes, it must be established whether there are erotic practices with the self; if there is no ascertainable sexual life as such, into what channel has the sexual impulse flowed? These facts must be known, not merely at one or another given time, but over the entire sexual period of the life. To indicate a completely frigid woman, every point must be invariably negative."

In the deductions and interpretations one sees that many of the accepted ideas of the psychoanalytic school are used and paraphrased, particularly in respect to the super-ego. There is a consistent attitude to a woman as a biological unit. The "unconscious" is tacitly assumed by Miss Beam to play an important, if not predominant rôle.

In discussing the difference between the frigid wife and the wife with dyspareunia, the authors rightly stress the interchange of values of physical symptoms and mental reverberation. It is highly suggestive that a considerably larger percentage of brides who received premarital instruction from Dr. Dickinson had orgasm. It should, however, be remembered that their very coming for premarital instruction connoted a certain absence of the factor of refusing to face reality. The cases of dyspareunia are well summarized, the general conclusions being considerably more valuable than the attempt to utilize the relatively small number of cases statistically. Among the statistical facts of great interest, is the number of cured dyspareunia cases that remain frigid.

In the chapter on substitution and compensation, we are given a good description of sublimation, regressions, substitute formations, reaction formations as types of defense against pain in its broadest sense. These are lumped together as the "third direction." The text reads very simply to the initiate, yet, I think, will offer some difficulty of digestion to "lay" physicians on account of the very necessary abbreviation. I regret that the important statement, that true sublimation is an unconscious process, was omitted. This fact limits considerably the rôle of the physician as *deus ex machina*.

Any conclusions drawn from the percentages of neurotic, neurasthenic, psychotic, etc., patients must take into account that Dr. Dickinson's definitions of these categories are quite at variance with our present classification. For instance, he calls hysteria a psychosis and uses the word neurotic in a different sense from the present-day psychiatrist. This is less of a criticism than a warning to a capacious reader. One gets the feeling that the case handling is not profound and radical in the neuropsychiatric sense. Of course, the effect of early traumatic experiences and

childhood memories is repeatedly mentioned. Yet there is apparently no effort to correlate the dynamics of these as it is done, for instance, in a searching psychoanalysis. It is not practicable, nor even advisable to analyze so many people and it is to be remembered that the later patterns of behavior reflect by "repetition compulsion" the earlier ones. We are dealing then, with an "as if" concept, and the level at which the problem is approached may not matter. I hardly think that there has been sufficient emphasis on the incidence of early neuroses (in the modern sense) with which husband or wife or both come into marriage, and have the feeling also that this factor is of far greater quantitative importance than one would gather from a study of these cases. Acceptance of this point should throw considerable light on the instances of apparently well equipped couples, in which the marriage results in unhappiness. A person takes himself or herself along wherever he or she goes, even if it is into marriage. I suppose the book assumes on the part of the reader a considerable knowledge of transference phenomena. I hardly know whether such an assumption is valid. A careful perusal of the cases, the discussion and the therapy where it is given in the text, will convince the discerning reader that the particular personality of the gynecologist played a large rôle in case selection, in the communicativeness of the patients and in the efficacy of his suggestions.

I agree with Miss Beam that the balance between mental and physical manifestations of fear is unpredictable. A statement, however, that physical pain tends to vary inversely as mental suffering in the cases of dyspareunia, is slightly misleading, for this would depend to some extent, upon the form of neurosis present. On page 345, last paragraph, Miss Beam touches on the concept of the polarity of fear (fear and wish), the ambivalent attitude toward coition, creation and annihilation, in a fashion quite consistent with the most modern psychoanalytical approach. I doubt, however, whether this paragraph and its connotations can be fully grasped by people untrained along these lines. The apparent omission, that some cases were not referred to a psychoanalyst for radical investigation can be accounted for in part, by the dates of the observations. I have the feeling that at the present time, at least a few of the cases cited would be considered fit subjects for formal analysis.

It is pleasant to note the absence of condemnation of individuals, the insistence on a realistic point of view. This does not mean that there is not ample evidence in both authors of idealism. The ideal of beauty in the case of Dr. Dickinson is often translated into terms of line and mass, and in the case of Miss Beam into a lovely parallelism with musical form and architectonics. The fluency, forcefulness, clarity and great delicacy of her text is an outstanding feature.

Really reliable facts in regard to the average sex lives of married couples are so rare that this forms a notable addition. That they are from a somewhat selected group does not militate against their value, for it is quite reasonable to assume that the results are not far removed from the general, except in minor and ascertainable details. The book will repay the closest scrutiny—more than that; only the closest scrutiny, open-minded, patient and discerning, will afford a true estimate of its great worth.

This book should be read by every gynecologist, though not every gynecologist will understand it to its full, or be able to utilize its lessons. The approach used by Dr. Dickinson requires intuition, factual knowledge and experience, as well as a certain knowledge of one's self as a human being. One cannot expect to find these multiple requirements universally distributed. Nevertheless, it should be read as an antidote to shopworn teachings and shopworn attitudes toward gynecologic patients. The book takes its place in this respect, with a forward trend of the times.

The book will prove useful as a source book, full of illustrative and instructive cases, as a stimulus for gynecologists in demonstrating what can be done by thorough work and patient listening and how much there is in the material that they meet with daily, which has not been utilized. It is in addition, a condensation of most of the available knowledge to be found in such books as Reich's "Funktion des, Orgasmus," Walthard, Halban, Liepmann, etc. It has, as well, a considerable methodological interest. It can be heartily recommended for its honesty, intense sincerity, scientific adherence to objectivity in spite of well-defined original hypotheses.

—Max D. Mayer.

GYNECOLOGY

Gynecological Surgery,² appearing in French, covers the entire field in a most thorough fashion, emphasizing French methods but doing full justice to the schools of all nations. The introductory chapters deal with general symptomatology and include such diverse subjects as study of the blood and urine, acid-base equilibrium, basal metabolism, menstruation, "ananeose" by which he signifies rejuvenescence (including ovarian grafts), as well as technical diagnostic procedures and salpingography. These chapters cover 100 pages. The next 40 pages are devoted to surgical technique. The remaining 600 pages of this large volume contain a detailed description of gynecologic operations. Vulvectomy is fully described, including the removal of the gland bearing areas. A large amount of space is devoted to birth injuries and repair of the pelvic floor, with an excellent chapter on the statics underlying this condition. The author, in my opinion, correctly places considerable emphasis on constitutional factors. He advocates the suture of the exposed levatores ani. In the construction of artificial vagina he describes the Baldwin, Graves, Schubert, and Heppner-Pozzi techniques. A large number of operative procedures for the cure of vesicovaginal fistula are given, frequently, however, associating names with them that ignore the actual deviser of the methods. The operations for uterine displacements are numerous including techniques not found in most textbooks. In extended hysterectomy for carcinoma, he habitually ligates the hypogastric vessels. Every gynecologic operation on the uterus, ovaries and tubes will be found fully described.

It is impossible in a brief review to even indicate the encyclopedic contents of this excellent gynecologic surgery. The value of the book is greatly enhanced by the large number of illustrations (966 figures), some original, many of them from the original sources to whom due credit has been given. The majority of illustrations have been excellently redrawn in line, which adds further to their graphic value. The text on the whole is clear and concise. Each chapter contains an extensive bibliography. Perhaps in the next edition the author, whose experience seems to be large, will be less impersonal and mention his own preferences and reasons for choosing the individual operations from the many at the disposal of the operator.

—R. T. Frank.

*Appareil Génital de la Femme*³ is the second monograph to appear in the series of "Diagnosis, Anatomical and Clinical" of Paul Lecène, published in memory by his pupils and largely based on the notes left by this famous physician. Moulouguet and Dobkevitch have covered the entire field of gynecology in an interesting and informative fashion. Taking up individual lesions, some summarily, others in de-

²Gynecologie Chirurgicale. Par C. Sobre-Casas. G. Doin & Cie, Paris, 1931.

³Les Diagnostiques Anatomico-Cliniques de P. Lecène. Appareil Génital de la Femme (Première Partie). Par P. Moulouguet et S. Dobkevitch. Masson et Cie, Éditeurs, Paris.

tail, the amount of space devoted to the lesions has frequently been guided more by their predilections than by the importance of the condition. They have been influenced it would seem, more by the teachings of their master than their own opinions in certain fields. For example, Leeëne did not believe in immediate repair of torn perineums even if the tear was complete. The operations recommended secondarily after the mucous lining had spontaneously undergone repair, were simple but effective; anterior and posterior plastics; in older women the Lefort operation, and rarely hysterectomy.

Among inflammatory lesions, the rare condition of tuberculosis of the Bartholinian gland is described most minutely. Elephantiasis and esthiomène are considered identical lesions. Kraurosis, leucoplakia, Bowen's and Paget's disease are considered under dystrophies. A number of cases of carcinoma of the vagina after complete hysterectomy are mentioned.

The difficulty in diagnosing ectopic gestation is stressed as it should be by every gynecologist. No mention of the biologic tests are made. Accidents resulting from pregnancy, such as uterine tears, retention of placenta, etc., are fully described. A detailed description of gonorrheal infections is likewise offered. Sharp distinction is drawn between the hot and cold stages of salpingitis. An operation for anteposition of the adnexa, with which I am not familiar, is described. The adnexa are placed in front of the broad ligament through a small incision made in this diaphragm. The illustrations in this book are excellent and worth careful study. The entire book is pleasant and informative reading to the advanced student, the clinical gynecologist and the gynecologic pathologist.

—R. T. Frank.

OBSTETRICS

In this well-illustrated volume of 208 pages Putschar⁴ presents a most thorough study of changes produced in symphysis and sacroiliac joints chiefly under the influence of pregnancy and labor. The entire problem, so full of practical features, has aroused the interest of investigators only recently. The author's material consisted of fetuses of all ages, newborn and grown individuals of both sexes and all ages, making available for careful examination 198 symphyses and 78 sacroiliac joints.

The author differentiates eight different types of symphyses. He ascertained interesting sex differences in regard to the retropubic eminences which are seen in women as early as the twenty-third year but in men never before the thirty-sixth. About two-thirds of all individuals have this retropubic eminence, but it is more common in women and in them is dependent upon the number of pregnancies.

In connection with pregnancy and birth a hyperemia and hypertrophy of the ligaments occurs in the symphysis. Unless the child is very small, tears and hemorrhages in the ligaments about the symphysis seem inevitable with birth.

Changes of the type of arthritis deformans are seen in most adult pelvis and especially in sacroiliac joints even before completed growth. This is presumably the result of the upright position resulting in strain and, at times, trauma. In three sacroiliac joints studied immediately after labor no cartilage regrowth was found, but all the ligaments were hyperemic, as were the capsules, periosteum and bone marrow. Regularly following birth one finds marked hyperemia and hemorrhages, spreading of the joint space and stretching of the anterior ligaments. In cases of twins and two primigravidae the cartilage was torn and also the capsules in many cases.

⁴Beckenverbindungen des Menschen mit besonderer Berücksichtigung von Schwangerschaft, Geburt und ihren Folgen. Dr. Walter Putschar in Goettingen. Gustav Fischer in Jena, 1931.

This might be accepted as proof that the sacroiliac as a true joint has more play room than the symphysis. The author does not believe that childbirth in itself causes arthritic changes in the sacroiliac. Osteoarthritic processes are seen more frequently in parous women, but at the age of approximately fifty both sexes are about equally represented.

After labor all pelvic ligaments are relaxed. Tears of the symphyseal and stretching of the anterior ligaments of the sacroiliac joints are noted, so that there remains no doubt that during labor the pelvic outlet actually enlarges.

This volume contains much of interest both to the orthopedic surgeon as well as to the obstetrician.

—Fred A. Jostes.

The first edition of this book⁵ appeared in 1917. Williams has also published a very interesting book on the diseases of the genital organs of domestic animals. It is surprising how much of interest the gynecologist and obstetrician will find in the pages of these veterinary obstetrics and gynecologies. The point of view is fully expressed in the preface in which the author says "the treatise is based upon the belief that the pathological phenomena of veterinary obstetrics are as natural as those of physiological birth, are authentically predictable, and subject, in an important degree, to control." This is of course due to the fact that the data of the heredity of large numbers of animals is at the disposal of the investigator and that breeding is completely under his control.

Some of the observations of most value to the obstetrician and gynecologist are worth quoting. In the mare, ovulation begins at 10 to 12 months of age but the offsprings of such breedings are poor and the labor is dangerous. Psychopathologic sex desire has been observed in both sexes, particularly in cattle. In cows, cystic ovaries commonly produce nymphomania. Sex desire frequently remains, although to a diminished degree, in stallions and bulls castrated in adult life. The sexual wandering of domestic animals is a regular phenomenon and is the cause of the spread of infectious diseases. The conception rate following copulation runs approximately parallel to the regularity of the estrual cycle. A cow failing to conceive, commonly "menstruates" within twenty-four to thirty-six hours after the end of estrus. This "menstruation" however, cannot be compared with the menstruation of anthropoids. No primary extrauterine pregnancy has been observed in animals. Abdominal pregnancy, when found, can always be traced to rupture of the uterus or the vagina. With sexual health, the number of young increases and the parity of the sexes is well balanced, while abortion and dystocia decline. Most domestic animals eat the placenta, with the exception of the mare. Extensive studies have shown that the sire is not the cause of dystocia.

This volume covers all phases of animal obstetrics, including obstetric physiology and pathology. Of particular interest are the many causes of dystocia among which may be mentioned persistent median wall of the müllerian ducts in the vagina, persistent hymen, and rigor mortis of the fetus. The subject of parturient eclampsia should be of interest to all. The entire volume can be recommended to obstetricians and gynecologists who are interested in comparative studies.

—R. T. Frank.

⁵*Veterinary Obstetrics.* By W. L. Williams. Ed. 2. Published by the Author, Ithaca, 1931.

Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Selected Abstracts

Kidney Disease in Pregnant Women

Kamniker: *Kidney Function in Pregnancy and the Puerperium.* Ztschr. f. Geburtsh. u. Gynäk. 94: 622, 1929.

Kamniker tested the kidney function in normal healthy pregnant women and found a retardation on one side in 50 per cent of the cases. When he tested the function in pregnant women complaining of ureteral pains, then the percentage was over 60 per cent, and in pyelitis, it rose to over 90 per cent. This retardation in function is not due to a decrease in secretion by the kidney, but is due to a stasis in the ureter, which is dilated. This stasis also has an effect on the peristalsis, which shows marked irregularities, and likewise on the renal function on the affected side, as the urine is concentrated more slowly. On x-ray examination ureteral dilatation may be demonstrated when the excretion of the dye is retarded. The dilatation and retardation of secretion disappear after delivery. The writer could not demonstrate this stasis before the fourth month of pregnancy nor after one week postpartum; it most frequently occurred between the sixth and eighth month of pregnancy.

In these months of pregnancy, the clinical picture of pain in the flank, usually the right, associated with normal urine, the ureter sensitive to pressure, and retardation of the secretion of the dye, indicates dilatation and kinking of the ureter.

LESTER E. FRANKENTHAL, JR.

Brakemann, Otto: *Changes in the Urinary Tract in Pyelitis of Pregnancy.* Zentralbl. f. Gynäk. 54: 278, 1930.

The author believes the changes occurring in the ureter during pregnancy are in the middle third of the tract because of the anatomic relations of the ureter. In this third there are few supporting structures, and therefore it is not surprising that kinks and lateral displacements occur. In the nonpregnant individual, dilatation of the ureter must be considered as due to toxic paralyses of the smooth muscles of the ureter, but in the pregnant woman there is the added cause of pressure of the growing uterus on the ureter. Pressure and toxic paralysis, working together, cause a marked dilatation of the upper part of the ureter in pyelitis of pregnancy.

WILLIAM F. MENGERT.

Guthmann and Ehrhardt: *The Physiologic Limits of Ureteral Dilatation in Pregnancy.* Zentralbl. f. Gynäk. 55: 341, 1931.

The authors believe that a dilatation of the ureter from one finger to two thumbs in thickness as observed on an x-ray plate, should be considered as still physiologic during pregnancy. Dilatation may occur to a marked degree without any resulting

pain, and if the urinary findings are negative, the condition must be accepted as the physiologic accompaniment of pregnancy. Such a dilatation may be considered pathologic only when there are abnormal urinary and kidney findings associated with pain, provided the pain disappears temporarily following mechanical or pharmacologic emptying of the ureter.

WILLIAM F. MENGERT.

Schumacher: X-ray Studies of the Changes in Renal Pelvis and Ureter Due to Pregnancy. *Arch. f. Gynäk.* 143: 28, 1930.

Schumacher studied the changes produced in the renal pelvis and ureter by pregnancy by means of intravenous pyelography. He states that all of the methods previously used were not physiologic and resulted therefore in erroneous conclusions. Intravenous pyelography produces no pathologic or abnormal changes and the results of these studies are therefore accurate and precise. One hundred women were studied at various intervals throughout pregnancy. No changes were found in the normal course of the ureters, during the first five months of pregnancy. However, the abdominal portions of the ureters appeared hypotonic and dilated in many instances even early in pregnancy. From the fifth to sixth month, 50 per cent of the ureters and 80 per cent after the seventh month were pushed laterally and posteriorly throughout their abdominal course. After the fifth month, ureteral dilatation is present in 100 per cent and is bilateral in 83 per cent. In 15 per cent only the right ureter was involved and in 2 per cent only the left one showed dilatation. This dilatation amounts to at least 2 cm. and is present in multiparae as well as in primiparae. By contrast, the pelvic portions of the ureters were found to be dilated in only 2 per cent. The remaining 98 per cent showed normal tonus and peristalsis in this area. The dilatation is due to pressure of the pregnant uterus which pushes the ureter against the belly of the psoas muscle. The right ureter is more frequently dilated and to a greater degree as result of greater pressure due to uterine torsion to the right. Type of pelvis, and fetal position and presentation have no effect upon the amount of pressure exerted. The asthenic type shows more compression than does the normal type.

RALPH A. REIS.

Albeck, V.: Sixty-nine Cases of Febrile Pyuria Gravidarum. *Acta Obst. et Gynec. Scandinav.* 9: 30, 1930.

Among 10,000 parturient women the author found 226 cases of pyuria. Of these, 69 patients had fever during pregnancy or labor. Only 15 patients had premature labor and in 6 instances, toxemia of pregnancy was most likely the cause. In 6 cases, pregnancy was interrupted therapeutically, hence in about one-third of the cases pregnancy did not go to term. The fetal mortality was 11.6 per cent. Only one mother died but one had a nephrectomy before she left the hospital. All the patients still had a bacteriuria at the time they left the hospital in spite of intensive medical treatment.

J. P. GREENHILL.

Popoff and Spanswick: Pyelonephritis of Pregnancy due to Eberthella Alcalescens. *J. Lab. & Clin. Med.* 16: 437, 1931.

A primigravida, aged twenty-three years, three months pregnant was admitted to the hospital with a diagnosis of pyelitis complicated by vomiting of pregnancy. Cystographic examination revealed a generalized cystitis with both ureters in normal position and with no dilatation or angulation. The urine obtained directly from both

kidneys by ureteral catheterization was full of pus. Functional phthalein test after fifteen minutes gave 25 per cent on the left side and 0 on the right side. X-ray pyelograms were normal. Urine cultures showed large numbers of gram negative nonmotile bacilli resembling *B. dysenteriae*. The same organism was recovered from the stool. Blood culture was negative. In view of the progressive toxemia, a therapeutic abortion was done, eighteen days after admission. The patient made a prompt recovery.

Appropriate cultural and agglutination tests on the organisms identified them as *Eberthella alkalescens*. Such cases of dysenteric pyelonephritis are very rare. Similar cases previously described agree with the identification of this organism. Since both the urine and feces contained the same organism the authors assume that the infection in the kidney was lymphogenous in origin from the large bowel.

W. B. SERBIN.

Levy-Solal, Dalsace, Misrachi and Solomon: A New Procedure for the Radiologic Exploration of the Pregnant Woman. *Bull. de la Soc. d'obst. et de Gynéc.* 4: 228, 1930.

The authors employed the technic of Lichtenberg and Swick for obtaining pyelograms after the intravenous administration of uroselectan. In normal cases about 90 per cent of the drug is eliminated within eight hours, hence this method not only permits visualization of the urinary tract but also offers a means of determining renal function. It eliminates the trauma associated with the passage of ureteral catheters and also enables one to examine both ureters at the same time. The authors show two radiographs taken of pregnant women and these are most likely the first ones taken after the employment of this special technic. No harmful results were observed.

J. P. GREENHILL.

Davidson and Turner: Bilateral Cortical Necrosis of the Kidneys. A Clinical and Pathological Report of Four Cases. *Edinburgh M. J.* 37: 101, 1930.

Bilateral cortical necrosis of the kidneys is very rare and comparatively symptomless. It appears that in the early stages at least the only prominent feature of the disease is suppression of the urinary secretion, which may be partial or complete. All four cases here reported presented the same characteristics: progressively increasing drowsiness, air hunger and diminished secretion of urine.

The pathologic changes found in the four cases were typical for bilateral cortical necrosis of the kidneys. In only one case was there any distinctive change found in the liver. Otherwise there was nothing suggestive of the liver typical for eclampsia.

All the cases showed a well-marked thrombosis of the interlobular arteries and afferent vessels of the glomeruli. There was no evidence of any marked vascular degeneration such as arteriosclerosis, nor was there any change indicative of chronic interstitial nephritis. Edema of the interstitium was present, but was probably just an accompanying change or a result of the necrosis.

Some evidence of generalized infection was found in three of the cases examined. Of course this is not always conclusive. Infection may be a terminal or concomitant condition.

All treatment for such cases either conservative or operative seems to be futile.

WM. C. HENSKE.

THE AMERICAN BOARD OF OBSTETRICS AND GYNECOLOGY

At the meeting of the Board held in Chicago December 29, 1931, forty (40) applicants for certification were examined. Of this number twenty-nine (29) applicants were approved, eight (8) were conditioned and three (3) failed.

The next written examination of the Board will be held in nineteen (19) different cities of the United States and Canada at 2 P.M. on Saturday, March 26, 1932. The general, oral and clinical, examination will be held in New Orleans on Tuesday, May 10, 1932, immediately preceding the meeting of the American Medical Association. Reduced railroad fares will be available. For detailed information and application blanks apply to the Secretary, Dr. Paul Titus, 1015 Highland Building, Pittsburgh, Pennsylvania.

THE AMERICAN BOARD OF OBSTETRICS AND GYNECOLOGY

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Original Communications

THE NEWER OBSTETRICS*

PRESIDENTIAL ADDRESS

By ARTHUR H. BILL, M.D., CLEVELAND, OHIO

AFTER one has been in practice for a considerable time, he is justified in dealing in reminiscences. To me it is most interesting to recall the changes which have taken place in the practice of obstetrics during the time in which it has been my privilege to follow this especial field and to contrast the methods of yesterday with those of today. Along with the great progress in the practice of medicine in general it would seem that obstetrics has to a large extent kept pace. I well recall at the very beginning of my practice a conversation with a former executive of the University, in which he asked, "Is there really anything new to be learned about that extremely old process?" I wondered if I had in fact decided to spend my career in a sterile field. His question undoubtedly reflected the usual attitude toward obstetrics at that time. We frequently heard or read that obstetrics was the most neglected branch of medicine. However, during the period of twenty-five years, the changes in obstetric practice have been so great that the subject could be almost entirely rewritten as concerns procedures.

It is also interesting to note the part taken by our Society in this development, for many of the important innovations were inaugurated by its own members. In the changes which have taken place we find certain new methods, some of which were devised as purely obstetric, and others devised for the general practice of medicine but adopted as

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especially useful in obstetric practice. Many of the procedures advocated during this period were short lived, while others were found to have real worth and have remained in use. Perhaps of greatest importance is the marked change in the general attitude of obstetricians toward the conduct of labor.

It would seem that the most marked feature of present-day obstetrics, is the fact that there is a distinct spirit of activity, of being ever alert to do something to relieve the patient and to safeguard her and her baby from the dangers which are ever associated with labor, as against the older policy so often expressed of letting nature take its course.

Let me mention briefly those developments and innovations which in my opinion have had the greatest influence on obstetric practice, during the approximate period mentioned. There were of course many others and some of these were inaugurated shortly before this period but were not in general use.

Perhaps the most outstanding development in obstetric practice has been the establishment of prenatal care as a definite part of the treatment of the obstetric case and the education of the laity to the extent of practically demanding that kind of observation from the physician. Instead of the patient engaging her physician and perhaps not seeing him again until the time of delivery, we find her going at regular and frequent intervals for observation and examinations, and this to an increasing degree even to general practitioners. The development of the sphygmomanometer had great influence on the development of prenatal care, and proved to furnish the most important method in the early detection of preeclamptic toxemia, and therefore, in the preventive treatment of eclampsia. The beneficial results of prenatal care have been many, but its influence has been outstanding on the control of toxemia. The incidence of eclampsia has been reduced to a surprising extent and while the treatment of eclampsia proper has not changed materially, for its cause and, therefore, its specific treatment are still unknown, it is accompanied by less interruption of pregnancy than formerly and in general the results are somewhat better. Eclampsia, however, still remains the most important problem in obstetrics.

Efforts to treat complications as such, rather than to terminate the pregnancy are noted to a continually increasing extent and are praiseworthy especially as concerns many which are merely incidental to pregnancy. The old tendency to advise interruption of pregnancy as a cure-all for almost any serious complication is giving way to a policy of allowing the pregnancy to continue and endeavoring to correct the complication in more and more instances. Altogether there is far less induction of labor than formerly. Prenatal care has become an intricate and inseparable part of the treatment of the obstetric case.

The development of the technic of blood transfusion has been of inestimable value to obstetric practice and has given the obstetrician the

means of overcoming some of the tragic complications of obstetrics which had previously been somewhat hopeless, for example, placenta previa, ablatio placentae, rupture of the uterus, ectopic pregnancy, postpartum hemorrhages, and hemorrhages in the newborn child, as well as some infections.

The scope of cesarean section has been somewhat broadened and its technic has been markedly improved. There is no doubt that with the enlargement of the field of this operation there has been great abuse and a vast number of needless cesarean sections have been performed. This abuse of cesarean section, however, cannot be attributed to any considerable extent to well trained obstetricians. It is a well known fact that the better trained in obstetrics a physician is, the fewer cesarean sections he finds it necessary to perform. The surgeon untrained in obstetrics and unfamiliar with the complications of labor and lacking the proper judgment and ability necessary to correct such abnormalities often attempts cesarean section as the easiest method for him. A good illustration of this is the performance of cesarean section in cases of occipitoposterior positions where pelvic measurements are good. Apparently this is not an uncommon though an unwarranted procedure. We find, however, that in addition to its use in cases of obstruction, cesarean section has been responsible for improved mortality rates in such cases as placenta previa, ablatio placentae, cardiac cases, and some cases of toxemia.

Undoubtedly no advance in obstetric practice during the past generation stands out as prominently as the treatment of the antepartum hemorrhages by blood transfusion and cesarean section. With the development of abdominal cesarean section certain procedures such as the accouchement forcè, the use of the Bossi dilator, pubiotomy and vaginal cesarean section have either fallen into disuse entirely or into the background. Altogether more consideration has been given to the interests of the unborn child and craniotomy is now seldom performed and almost never on the living child.

The introduction of pituitary extracts has had a real influence upon obstetric practice. When these extracts were first introduced their use was associated with much abuse and much harm was done in attempts thereby forcibly to shorten labor. With the almost universal abandonment of this practice among obstetricians there remained the unquestionable value of pituitary extracts in stimulating uterine contractions after the second stage and in the operation of cesarean section. Their routine use during the third stage of labor and during the immediate postpartum period has been the means of preventing many cases of postpartum hemorrhage.

Altogether greater emphasis has been laid on the scrupulous maintenance of asepsis in its broadest sense. A more general adoption of rubber gloves in obstetric practice has served to greatly improve

aseptic technic and to impress upon the physicians who conduct labors that obstetrics is decidedly a surgical specialty and in their technic they should be even more painstaking than the general surgeon. The introduction of the long-sleeved rubber glove has immensely facilitated the procedure of podalic version and lessened the dangers of infection associated with its performance.

Through the daring and skill of one of our members the podalic version has taken a place in obstetric practice formerly believed unthinkable. It has been definitely proved that podalic version is a far safer procedure than high forceps. Forceps deliveries have been greatly modified by the newer obstetrics. Today forceps are used more frequently than formerly and yet far more safely. With the almost general abandonment of the high forceps operation most forceps deliveries have become comparatively easy and include chiefly either low forceps or the corrective forceps for the rotation of posterior positions to normal ones. The use of prophylactic forceps has become more common and its advocates have been able to show real benefit when proper technic is used. Altogether the performance of both version and forceps deliveries has become characterized by a greater delicacy of maneuver in marked contrast to the strenuous and often brutal efforts formerly seen.

In the relief of pain during labor we note a startling contrast to the older methods. The custom of giving nothing at all for the relief of pain or of giving only a few whiffs of anesthetic as the baby's head is being delivered has become obsolete. Safe methods have been developed whereby the pain of the entire labor may be practically eliminated, and painless or comfortable labor has become an actuality.

Hospitalization of maternity patients has increased to a remarkable extent and it is encouraging to note the greatly increased number of specialized maternity hospitals in this country. The advantages of the isolated maternity pavilion in stimulating the advance of maternity welfare, in the training of obstetricians and in the prevention of infections have been definitely proved. The reduction of the most outstanding cause of maternal mortality in this country, infection, will come through a better realization of the importance of the principle upon which the isolated maternity pavilion is based, namely, that there should be no possible communication between it and any sources of infection. This is an old law but one continually broken both by general practitioners who continue to go from infected cases to confinements, and as regards hospitals in which the maternity ward is so located and the medical and nursing staffs so organized that transmission of infection can scarcely be avoided. Altogether there has been a great revision of obstetric practice and while all the methods mentioned can not be said to be adopted by a very large percentage of obstetricians, they are, with slight modification and in principle at

least, followed by a sufficiently large number to form what may be called the new school of obstetrics.

In the newer obstetrics the patient in labor is given something to relieve pain as soon as she complains or is obviously suffering. Measures for the relief of pain are continued from this time until the completion of labor. In a large percentage of cases the patient awakens with no recollection of the labor, and in all cases she has at least been comfortable. The newer obstetrics countenances neither meddlesome interference nor dilatory negligence when there is a correctible abnormality. As long as there are no serious complications labor is allowed to take its natural course until the time when, in the absence of deviations from the normal mechanism, there should be definite progress. The employment of these relief measures has also resulted in more constant watching of the patient during labor, more frequent observation of the mother's condition and of the fetal heart and an alertness to detect complications which sometimes unexpectedly arise. The nurse anesthetist and the nurse especially trained for the conduct of labor have taken a most important part in the development of this phase of modern obstetrics. Complications of position are corrected early in the second stage that the patient may be saved wasted effort. Prophylactic version and prophylactic forceps are commonly used. Such procedures as routine induction of labor, stimulation of pains by pituitary extracts or any of their modifications, manual dilatation of the cervix to hasten progress, except in extreme urgency, are not recognized as proper.

What is to be the future of this newer obstetrics? Is it destined to be followed by an increasing number of obstetricians as the years go by and is the future development of obstetric practice to be according to the same general policy? There seems to be a feeling of scepticism on the part of many obstetricians who while admitting the advantages to the patient of such methods when properly carried out, doubt the wisdom of approving them because such procedures are not within the capabilities of the profession as a whole. However, there has been a tremendous change in the general attitude of obstetricians toward the conduct of labor. The expressed opinion of members of this society may be taken as an index. Many of us will remember the heated and almost bitter discussions in this Society fifteen or twenty years ago concerning the relief of pain during labor. There was much opposition even to giving anything for the relief of pain and yet today while there may be a difference of opinion as to the merits of individual methods the principle of the relief of pain is almost universally accepted. I well recall being taken to task by a very esteemed member and former president of our society for giving anesthesia during the entire second stage of labor, but today it is granted that the first stage of labor may also be made painless. You will also recall the heated discussions con-

cerning the use of the podalic version and prophylactic forceps. However, these procedures are now accepted as reasonable when proper technique is used and are being adopted by an increasing number of those who are carrying out the principles of the newer obstetrics. If the early advocates of these procedures went a little too far and overstepped the bounds of wisdom, their action may be justified by the ultimate result of establishing the real worth of these methods. The old-fashioned obstetrics was so deeply rooted that it required almost a tornado to uproot it or an earthquake to rattle the old bones of its undying adherents. If there are sins of commission in the new school, they are many times balanced by the sins of omission in the old school. Revolutionists usually go to extremes but the pendulum eventually swings back to establish the changes on a sound basis and the changes in obstetrics amount almost to a revolution.

With the influence of Societies such as this, we need not fear the ultimate results of these rather drastic changes. While in our Society there are those who are impulsive and sometimes seem radical, there are, to balance these, other members who are reluctant to agree to many innovations. There is always a balance of ideas which tends to insure safety, and bring about a more definite standardization of methods. A definite standardization of methods, to be sure, will be most difficult to establish and yet perhaps not impossible. At any rate there can be a standardization of the principles upon which individual methods are based.

If the mortality and morbidity results of the new school of obstetrics were actually as good as those of the older school, there would be much to be said in favor of the former. It would appear, however, that when carried out by the well trained and competent the newer methods show better results than the older. Painless labor and shortened labor are not necessarily synonymous, although both may have merit. It is possible to conduct a painless spontaneous labor; the shortening of the second stage being merely a natural result of the desire to save the patient which is responsible for analgesia and anesthesia. In other words prophylactic delivery is an attempt to relieve the patient of unnecessary physical effort and fatigue as well as mental and nervous strain, but only where conditions are such that this may be done without increased risk to either mother or child. Probably one of the chief reasons for the increasing use of the prophylactic delivery is the realization of the injurious effects on the child of prolonged second stage labor and of the fact that in many instances the welfare of the child is safeguarded by interference.

The contrast between the mental attitude of the women who live in a community where the methods of the new school are carried out as compared with that of women of a generation ago, is striking. As I remember patients of years ago, they had a dread of childbirth which

at times amounted almost to horror as they contemplated what had been impressed upon them from girlhood as a terrible ordeal. They were nervous and apprehensive and had many of the nervous complications of pregnancy which would naturally result from such a state of mind. Contrast this patient with the young woman who has learned from her friends that childbearing is no ordeal, in fact, a practically painless experience and not in the least disagreeable. She looks forward to the confinement with little or no fear but with perfect confidence that she will not suffer. Her pregnancy therefore, is not a period of worry. She is altogether a happier woman and free from the nervous symptoms of the patients earlier seen. Even the nausea and vomiting of early pregnancy is less and pernicious vomiting is rare indeed. The convalescence of such patients is also more rapid and freer from nervous disturbances.

The chief adverse discussion of the newer obstetrics is on the ground that the profession in general can not carry out such methods. This is perfectly true; for physicians untrained in obstetrics have no place in the new school, just as the physician untrained in surgery should not attempt to do major surgery. But this fact should not in any way detract from the development of obstetrics along these lines if it can be shown that those well trained can satisfactorily carry out these procedures. It is encouraging to note the great difference in the training for obstetric practice today as compared with that of a generation ago. When I graduated from medical school and was given a license to practice medicine including obstetrics, my experience amounted to attendance on two cases. One was a false alarm when after spending the night on the floor I went home the next day because the patient was not in labor; and the other was an actual delivery which I did not personally perform. Today in that same school, the Western Reserve University School of Medicine, each student who graduates has attended an average of fifty confinements, in addition to attendance at the prenatal dispensaries and postpartum rounds. Even with this amount of experience such a physician is qualified to conduct only normal labor. Upon graduation from the Medical School the physician should have a knowledge of the normal processes of pregnancy and labor. He should have obtained a satisfactory training and actual experience in the conduct of labor and in the delivery of normal cases, especial emphasis being laid on the strict observance of aseptic technic. Too much stress cannot be laid upon the latter, for the correction of the longstanding casual attitude of those in general practice toward the observance of surgical technic means indeed an uphill fight. The student should gain a thorough understanding of the deviations from the normal with a certain ability to recognize them; and should know that there are definite ways of meeting these complications. Most important of all he should be impressed with his own limitations so that

he will not attempt corrective measures which he has of course not mastered and will be more willing to seek help by consultation without undue delay. The usual tendency has always been for the general practitioner to attempt almost any sort of delivery and to seek help only after failure in his attempt. On this account consultation in obstetric practice has always been most unsatisfactory for the consultant may have little opportunity of accomplishing satisfactory results. Often his chief function is merely that of sharing the responsibility of the doctor in charge. We are not so optimistic as to imagine that all obstetric cases can eventually be cared for by the specialists, but it is at least to be hoped that in addition to those actually under their care a much larger percentage of complicated cases will be seen by them.

It has been suggested that changes in and limitations in licensing may be the solution to this problem, but in all probability it is being solved by the laity who are not slow to recognize and demand better care. We can not entirely ignore the demands of the laity. It is most unfortunate that lay groups have openly demanded a specific form of analgesia, and such should be condemned as dangerous propaganda. However, in condemning this action let us be careful not to overlook the propriety of their demanding relief of some sort in view of the proved success of such methods.

The newer obstetrics is for those who have spent sufficient time in preparation for this specialty. It is noteworthy that the modern trend is for much longer periods of obstetric training. Short services of from four to six months have become fewer and today a common course of training for the specialty is three years. In this connection let me mention the importance of the American Board of Obstetrics and Gynecology, a child of this Society and originally proposed by one of its members. Already, although only a year old, its influence is being felt upon the younger men who are planning their training on the requirements laid down by this Board.

Obstetric practice seems to be gradually coming into the hands of those especially trained. This generation or the next should see a large percentage of obstetric patients in the hospital under the care of specialists and while there may always be localities in which there is not a highly trained obstetrician, this situation is not very different from that of surgery and it is usually possible to secure the services of the surgeon when needed for consultation. Great progress in this direction has already been made. Let me give you an illustration: Twenty-five years ago there was no one in Cleveland who limited his practice entirely to obstetrics, although there were those who were competent in the methods of those days, and there was little hospitalization of patients. Last year (1930) 55.7 per cent of the confinements were in hospitals, and 21 per cent in specialized maternity hospitals. It has been estimated that in the first six months of 1931, 45 per cent

of the babies born in Cleveland were delivered by specialists or under their supervision. The number delivered by midwives has been reduced from 27.8 per cent to 6 per cent during the last ten years. Excluding the University home delivery service, only 30 per cent of the deliveries in Cleveland are in homes.

These rather remarkable figures are indicative of the general trend of obstetric practice and reflect the influence of the newer obstetrics, for it is to a large extent practiced in that community. The newer obstetrics is not radical. On the contrary, its fundamental principles are based on conservatism. Procrastination is not always conservatism and negligence is not sane obstetrics.

The new school of obstetrics, and I use the name with no apology, is without doubt here to stay. It is sound in principle, though of course there will be modification in individual methods to keep pace with progress. It has done much to make obstetrics a definite specialty and depends for its success solely upon the insistence that those who adopt its methods shall have the proper training to carry out its procedures successfully. For those who are not yet in harmony with its methods it would seem that opposition should be replaced by greater thought toward the training of practical obstetricians. Just criticism may be made of the training of obstetricians in some clinics of high rank. In those in which the older methods are used so much emphasis is laid upon the dangers of operative delivery methods, such as forceps and version, that they are performed so infrequently that the men in training do not become thoroughly familiar with the technique and hence do not do them well. It is also a far too common custom for the members of the visiting staff to perform a considerable percentage of such deliveries, further depriving the members of the resident staff of the experience. It would seem that one qualified to be a member of the visiting staff of a maternity hospital should not feel the need of such experience, but would be willing to act in the capacity of a teacher and supervisor of the men in training. Those who perform operative deliveries infrequently can not be expected to become expert in them. Probably in many instances doctors leave a clinic of high rank after a service of several years with a splendid scientific training and a thorough knowledge of the principles of obstetrics but with altogether too little experience in practical delivery methods. There is no doubt that much harm is being done as always before, by untrained physicians attempting delivery methods with which they are not familiar. Without question efforts should be continually made to discourage such practice. In the last analysis the physician who has had only the training in obstetrics which is given in the medical school should limit his practice to normal obstetrics. If he is not sufficiently skilled to perform prophylactic version or prophylactic forceps, he certainly is not qualified to perform forceps deliveries or versions under other

more urgent conditions; for, the prophylactic deliveries are in reality the easiest to perform because they are done under ideal conditions.

The Obstetric Clinic of Western Reserve University, may be taken as an example of the new school. While relief measures are used to the limit of safety, conservatism is in reality its foundation for every procedure is based on the principle of conserving the mother and baby in some respect and harmful interference is not tolerated. The success of these measures has been so thoroughly established that there is no longer an element of experimentation. In that Clinic special stress is laid upon teaching residents in training practical delivery methods and giving them sufficient experience to become expert in performing them. Relief measures to be used comprise only a part of the functions of such a clinic, but nevertheless furnish the chief controversial factor.

In addition to a thorough fundamental and scientific knowledge of obstetrics, the well equipped obstetrician of today should have a humane spirit which will make him ever ready to relieve the suffering of his patient; a conscience which will not allow him to break his aseptic technique even under the most trying conditions and keep him scrupulously careful to avoid all possible sources of infection; obstetric judgment developed by extensive training and experience, which is after all the greatest asset of the obstetrician; and finally the technical skill necessary to perform obstetric operations.

Strange to say I have often been asked what the obstetrician's reward is to be for making labor easy. This must always be a secondary consideration. It cannot be expected that the obstetrician who adopts the methods of the new school will endear himself to the hearts of his patients as did the physician of the old school who sat by his patient through intense suffering, having as his chief armament patience and encouragement and who only as a last resort delivered the baby and ended the ordeal. Appreciation comes mainly by contrast, and prophylaxis never impresses the patient's mind as much as cure. When a patient is carried through a labor in a state of practical oblivion and really has no knowledge of what a genuine labor pain is like, she cannot appreciate the worth of such treatment, as does the patient who is relieved after long suffering. The obstetrician's reward must be largely his personal satisfaction in the realization that he has been able to conduct comfortable and at the same time safe labors and thereby save the women of today the tortures of our mothers.

A STUDY OF THYROID ACTIVITY IN NORMAL PREGNANCY

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SINCE Magnus Levy (1897) studied the basal metabolism of a pregnant woman, there has been a voluminous literature regarding the role of the thyroid gland in normal pregnancy. According to Seitz the "composite picture of an enlargement of the thyroid gland, the increased iodine content of the blood, the increase in basal metabolism, and the rendering worse, clinically, of hyperthyroids in more than half of the cases, points with definiteness that during pregnancy more thyroxin is produced by the thyroid gland,"¹ Mussey, Plummer, and Boothby,² in 1926, and Mussey and Plummer in 1931³ reported a series of hyperthyroids complicated by pregnancy. These patients were treated for their hyperthyroidism medically, surgically, or with a combined treatment and very favorable results were reported. Therefore, Seitz' conclusions that hyperthyroids are rendered worse during pregnancy can be interpreted for untreated patients only.

In a thorough study of the phase of the problem of the thyroid concerned with the production of thyroid hormone in pregnancy, Anselmino and Hoffman have shown beyond question of doubt that a substance which fulfills all of the prerequisites for thyroxin is present in the blood stream of normal pregnant women. It is the purpose of this paper to review their work and present confirmatory experiments concerning one phase of the problem.

Abelin stated that "for the identification of an unknown substance as thyroid hormone, three different typical thyroid actions must be fulfilled, so that other substances which might give one or another of the thyroid actions may be ruled out." No specific test for the direct determination or demonstration of thyroid hormone is available. Eufinger, Wiesbader and Foesaneanu⁴ applied the Reid Hunt reaction as a direct test for the identification of thyroid hormone. The acetonitril, or Reid Hunt, test is based upon the greatly increased resistance of mice to acetonitril injected subcutaneously, when thyroid is administered to them, usually by mouth. The characteristic actions of acetonitril are due to its decomposition products. The most poisonous of these decomposition substances in the body is H CN. The formation of these products is due, apparently, to hydrolysis of the acetonitril molecule, but there are indications that simultaneous processes of oxidation are involved. Thus, in the majority of laboratory animals, with the increased oxidation, i. e., by feeding thyroid, there is a lowered resistance, the toxicity of acetonitril is enhanced, and they die. Mice alone become very resistant to this poison. It is this anomalous reaction of mice to acetonitril which gives the test its value.^{5, 6}

Eufinger, Wiesbader and Foesaneanu, therefore, injected mice, under standard condition, with blood serum from pregnant women and concluded that "the acetonitril resistance of white mice was undoubtedly increased by virtue of treatment with

the serum of healthy pregnant women." A gradual strengthening of this positive reaction was noted as pregnancy progressed, arriving at a height prepartum and falling in the puerperium. Cord blood was lethal to mice in much smaller doses than that of the mother, indicating a lesser concentration of hormone. This was considered to be a specific test for thyroid hormone until these same authors (Eufinger and Wiesbader⁷) obtained the Reid Hunt reaction by injecting white male mice with anterior pituitary hormone (Prähormon) and to a lesser degree with ovarian hormone (Hogival). Thus the thyroid specificity of the reaction was questioned. Possibly the original reactions with blood serum were due to pituitary or ovarian hormone. However, the Reid Hunt reaction was not positive for fetal blood and inasmuch as it is known that both pituitary and ovarian hormones are present in equal concentration in maternal and fetal circulation, the test, although not specific, may be considered indicative of the presence of thyroid hormone.

Anselmino and Hoffman,⁸ in the first of their publications, demonstrated that the pregnant organism splits considerably more carbohydrate into lactic acid than a nonpregnant one under like conditions. They concluded that this strengthened lactic acid production was referable to an increased thyroid activity. They also noted that patients suffering from Basedow's disease showed an analogous strong lactic acid formation at work and rest.

A constant characteristic of the metabolic activity of the thyroid hormone is an increase in acetone bodies in the hyperthyroid organism. The level of ketone body formations depends on the size of the disposable glycogen store, which, as we know, decreases materially under thyroid activity. Abelin and Jordi demonstrated that thyroid feeding and thyroxin injections into rats resulted in a threefold increase of acetone bodies in the urine. This finding was also noted clinically in hyperthyroid conditions. Porges and Novak observed that withdrawal of carbohydrates in pregnancy resulted in a much higher acetone body level in the urine than in nonpregnant women under like conditions.

Anselmino and Hoffman,⁹ therefore, injected a series of rats with serum from pregnant women. Acetone body determinations were made after the method of Engfeld. They concluded that a substance which markedly increased the acetone body production in rats was present in the serum of pregnant women. This substance was demonstrated in the first months of pregnancy, reached its maximum at term, and fell rapidly in the puerperium, being present in very small amounts on the sixth day postpartum. This substance could not be demonstrated in marked concentration in the nonpregnant state. The concentration in fetal blood was much lower than in maternal blood and generally could not be demonstrated at all in the former. This substance was identified as thyroid hormone, and one cubic centimeter at term corresponds to 10 γ thyroxin.*

Numerous authors agree that the basal metabolic rate at term is increased from 10 to 30 per cent above normal. This increase in basal rate has been construed by some to mean an increase in thyroid activity. Anselmino and Hoffman¹⁰ performed another series of experiments in which rats and mice were injected with pregnancy serum and the carbon dioxide production was determined. The technique for these experiments was that of Hoffner and Doederlein. Their results indicated that, uniformly, the CO₂ production and therewith the basal metabolism of those animals treated with pregnancy serum, increased markedly; whereas those injected with normal (nonpregnant) serum showed no change in metabolism. Here again the greatest increase was noted in the last month of pregnancy, with a rapid fall during the puerperium. Fetal blood was inactive, giving no such increase. Ultrafiltration of maternal blood rendered it inactive. Thyroxin caused the same reaction as pregnancy, 1 c.c. of serum at term corresponding to eight to 12 γ thyroxin.

*1 γ = 1/1,000,000 gm.

In addition to the above mentioned work, which uniformly demonstrated the presence of thyroid hormone in the blood serum of pregnant women, Anselmino and Hoffman discuss a series of clinical observations which lead to the same conclusions. An increase in the metabolic processes, as is found in the pregnant state, must set up a greater demand on the circulation.¹¹ There is uniform agreement that the minute volume of the heart is increased in pregnancy, and according to Davies, Meakins, and Sands this increase is in proportion to the increase in metabolism, the two being closely related. Linhard, who studied one patient throughout pregnancy and puerperium, determined that the heart minute volume is highest just before labor, with a subsequent fall in the puerperium. The increase in minute volume is also typical of thyroid activity. The degree of rise in pregnancy is similar to that of the mild forms of Basedow's disease which Zondek and Bansi call "Prä Basedow."

The minute volume can be expressed in the formula $\frac{\text{Blood Pressure}}{\text{Vessel Resistance}}$. The blood vessel resistance is indirectly proportional to the vessel cross-section. The blood pressure of healthy pregnant women is not or at least not much increased. The minute volume is undoubtedly increased. Therefore, the vessel resistance must be decreased by opening new arterioles and capillaries or dilatation of those already patent. This widening of the capillary bed is noted not only in the uterus and genitalia, but generally over the body. The radial pulse volume is increased, and Haupt concluded that the capillary cross-section of the arm is increased in pregnancy. Clinical observation of redness and warmth of the skin, etc., bear out these data. In Basedow's disease analogous experimental and clinical observations have been made.

In both pregnancy and hyperthyroid conditions a decreased oxygen consumption has been noted. With an increased minute volume of cardiac output, the amount of oxygen given off in the tissues per unit of circulating blood is decreased. Whereas in the nonpregnant state the blood gives up 30 to 40 per cent of its oxygen in the tissues, in pregnancy and Basedow's disease only 20 to 30 per cent of the oxygen content is released per unit of circulating blood.

When analyzed, all of the data concerning the circulatory changes in healthy pregnant women are analogous to that noted in cases of experimental and pathologic mild hyperthyroidism.

Schoenholz¹² determined that the circulating blood volume at the end of pregnancy is increased some 10 per cent above normal. Zondek and Wislicki found an increase in blood volume of as much as 30 per cent in severe hyperthyroid states.

In studies of the carbohydrate metabolism and the thyroid state, one of the most constant observations is that of a decreased glycogen level in the body following the administration of thyroid. Dresel pointed out that injections of small amounts of serum from patients with Basedow's disease into mice lowered the liver glycogen in the same manner as pure thyroxin, whereas healthy serum caused no such reduction. Anselmino and Hoffman¹³ performed a series of similar experiments using pregnant women's serum as the test material. Mice were injected with measured amounts of serum and after a definite lapse of time, the animals were killed and the liver glycogen determined. The liver was prepared by Pflüger's method and the sugar determined by the Hagedorn-Jensen technique.

These experiments indicated that a glycogen-reducing substance was present in the blood serum of pregnant women. Further experiments

also showed that this substance was present in increasing concentration as pregnancy progressed from the second month, and that there was a rapid decline during the puerperium. Another important finding was that the fetal blood caused only one-third as much glycogen reduction as maternal blood. These experiments were considered to be sufficiently important to bear confirmation.

In our series an attempt was made to follow the original qualifications for test animals and technique as closely as possible. Male white mice weighing approximately 20 grams each were used as test animals. These animals were from two separate strains and were labeled Series "A" and Series "B." Further subdivision into units of five mice each was made, each unit for one experiment. The mice were fed a routine ration of bread and water alternating with bread and milk. All animals were fed this measured diet for two weeks before they were used for any experiments. The test material was blood serum taken during the last three weeks of pregnancy or during labor, and the control was serum from nonpregnant women in an intermenstrual phase. The mice were injected subcutaneously in the back five times with 0.5 c.c. of serum each injection. Five mice were so injected for each experiment. Injections were made on the morning and evening of the first and second days and the morning of the third day, at twelve-hour intervals. About twelve hours after the last injection, the mice were killed and sugar determinations were made. A modification of the Pfluger's as described by Oleh, Walton and Serivner¹⁴ was used for preparation of the liver as follows:

1. Five c.c. 60 per cent KOH was measured into a graduated 50 c.c. Pyrex centrifuge tube and balanced on an analytical balance.
2. The five mice of each experiment were killed quickly individually by striking them on the back of the head; the abdomen opened and the liver removed quickly and immersed in the KOH. When the livers of the five of each set were so removed, the centrifuge tube containing five livers was weighed again. The tube was covered and set into a water-bath. Approximately 4.5 to 5.0 gm. of liver was obtained from five mice.
3. The tube containing the livers and KOH was heated in a water-bath for three hours and then
4. Made up to 15 c.c. with distilled water.
5. Two volumes (30 c.c.) of 95 per cent alcohol were added, and the tube allowed to stand over night.
6. The mixture was centrifuged, the alcohol poured off, and the residue (precipitated glycogen) was dissolved in 10 c.c. of water.
7. The alcohol was cooked off by placing the centrifuge tube in a water-bath for 10 minutes.
8. Two volumes of 95 per cent alcohol were added and allowed to stand for two hours.
9. Centrifuged, the alcohol poured off, and 5 c.c. water with one drop of phenol red were added.
10. N/1 HCl was added until neutral. Heated in water-bath ten minutes.

11. An equal volume N/1 HCl was added and the mixture hydrolyzed for three hours in a water-bath.

12. Neutralized with N/1 NaOH and made to 50 c.c. with water.

13. Filtered. Sugar determined by the Shaffer-Hartmann method.

By this procedure the mouse liver glycogen is expressed as glucose in grams per 100 c.c. of blood serum injected.

Our series, thus, also demonstrated the presence of a substance which lowered the level of liver glycogen of the mouse liver. The actual numerical differences between our series and that of Anselmino and Hoffman may possibly be explained by a difference in climate, difference in the strain of animals used and slight differences in technic.

TABLE I. SERIES "A". GLYCOGEN EXPRESSED AS GLUCOSE IN GM. PER CENT.
EACH FIGURE REPRESENTS ONE EXPERIMENT

CONTROLS (NONINJECTED) gm. per cent	INJECTED WITH NONPREGNANCY SERUM gm. per cent	INJECTED WITH PREGNANCY SERUM gm. per cent
3.160	2.863	2.517
3.810	2.990	0.837
3.742	2.910	2.307
3.600	3.300	0.985
		1.256
		2.752
		2.140
		1.920
3.578 gm. per cent	3.015 gm. per cent	1.851 gm. per cent

TABLE II. SERIES "B". GLYCOGEN EXPRESSED AS GLUCOSE IN GM. PER CENT.
EACH FIGURE REPRESENTS ONE EXPERIMENT

CONTROLS (NONINJECTED) gm. per cent	INJECTED WITH PREGNANCY SERUM gm. per cent
2.520	0.826
2.660	1.130
2.540	1.220
2.500	1.437
	1.770
	1.130
	1.220
	2.260
	1.470
2.560 gm. per cent	1.384 gm. per cent

TABLE III. RESUME

SERIES	CONTROL gm. per cent	NONPREGNANCY SERUM gm. per cent	REDUCTION PER CENT	PREGNANCY SERUM gm. per cent	REDUCTION PER CENT
A	3.578	3.015	16.0	1.851	45.3
B	2.560	—	—	1.384	45.9
Anselmino and Hoffman	5.07	3.65	26.0	1.40	72.0

Series "A" and Series "B" were of different strains and the experiments with the latter were performed in much warmer weather than with the former. Regardless of these variations, the fact that a markedly lessened glycogen content was noted in the mice injected with pregnancy serum remains as the important finding. Anselmino and Hoffman were able to demonstrate an action with 0.04 to 0.05 mg. of pure thyroxin, similar to that obtained when 2.5 c.c. of pregnancy serum were used. They concluded that the increase in carbohydrate metabolism of the pregnant female, which had, heretofore, been explained on the basis of the needs of the fetus and the growing maternal organs, could be accounted for by an active substance in pregnancy blood serum. This substance could, of itself, influence the carbohydrate metabolism as indicated by their series of experiments which we substantiate. Also, on account of a higher concentration of this substance in the maternal than in the fetal circulation, one may assume that this substance acts as or is attached to a molecule of sufficient size not to pass through the placental membrane and is protein-bound (Goldner). Furthermore, this difference in concentration is not found in the case of the anterior pituitary and ovarian hormones, which are found in the same concentration in maternal and fetal circulation.¹⁵

A general consideration of symptoms and findings per se makes pregnancy a "hyperthyroid state." The pregnant woman, as distinguished from a Basedow, is in a physiologic condition in which there is hyperfunction of the thyroid. Anselmino and Hoffman in their extensive and thorough study throw new light on the question as to whether the increased metabolism of pregnancy is due to the fetus alone or whether it is due to an increase in the mother's metabolism per se. Certainly they have demonstrated an increased level of thyroid hormone during pregnancy. Also evidence is certain that the level of this hormone is higher in the mother's circulation than in that of the fetus. However, though protein-bound thyroxin in all probability does not pass from the mother to the baby, one is not justified in assuming that such an exchange may not take place from fetus to mother. If the latter condition were possible, the level of increase noted could just about be accounted for by the mother's own thyroid hormone plus that of the fetus. Murlin¹⁶ concluded that "the energy production near the end of pregnancy is nearly equal to the energy requirement of the newborn, according to Rubner's law of skin area." Sandiford and Wheeler¹⁷ concluded that there is "a definite increase in the total heat production during the latter part of pregnancy . . . but that the rate of metabolism of a unit mass of the mother's tissue undergoes no material change, and that the increase in the total heat production may be accounted for by the increase in the amount of active protoplasmic tissue, which is composed chiefly of the fetus, with a small amount of new and accessory tissue of the mother."

P. Winfield¹⁸ observed that “. . . the calorie consumption at the end of pregnancy is 25 per cent higher per hour per kilo, than at the beginning of pregnancy. This raised metabolism probably takes place in the mother as there is no evidence that the metabolism of the fetus is greater than that of the mother.” Schwarz and Drabkin¹⁹ feel that “there is actually some evidence of an increased energy production of the mother during pregnancy.”

SUMMARY

Our results demonstrate conclusively, as do those of Anselmino and Hoffman, that a substance which lowers the level of mouse liver glycogen, is present in the blood serum of pregnant women. This glycogen reduction indicates an increased level of thyroid hormone in the test material (pregnancy serum) injected.

The evidence seems to indicate that this increase in thyroid hormone is due to an actual physiological hyperfunction of the thyroid gland of the mother during pregnancy.

I wish to thank Dr. Otto H. Schwarz for the privilege of presenting this paper and his many helpful suggestions in this work.

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(For discussion, see page 283.)

A CONSIDERATION OF CESAREAN SECTION, WITH A SURVEY OF 1047 CASES IN THE CLEVELAND REGISTRATION AREA IN FIVE YEARS

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THE courtesy shown by the hospitals of Cleveland in giving assistance in the survey was most gratifying. Only two failed to cooperate. All of the cases shown in our statistics were given personal study by one of us. It became apparent as the study progressed that figures alone cannot explain all the variations in results or in the percentages of sections made. In some institutions it is quite evident that injudicious selection of cases was responsible for poor results. In one or two with high mortalities, circumstances are such that the patients coming to the hospital are poor risks. The responsible heads of some hospitals decline operative risks which others accept in the interest of the patient.

Evaluation of these conditions is largely based upon personal judgment but the factors involved are very real and do modify any possible statistics. For these reasons as well as because we are indebted to the hospitals for their courtesy in facilitating our work, we have designated each institution by letter rather than by name.

We have made no attempt to tabulate obstructed labors complicated by other pathology, because the conditions become so complex that figures are of little value.

Cases in which the baby weighed less than 1500 gm. or in which the pregnancy was obviously of less than thirty weeks' duration have been discarded.

There have recently been published a number of more or less complete community surveys of cesarean section. Thompson for Los Angeles, Gordon for Brooklyn, Welz for Detroit, and Miller for New Orleans have made valuable studies. We have quoted freely from their statistics and our indebtedness is hereby acknowledged.

As shown in Table I there were during five years, 92,117 deliveries in the area studied. Of these 45,650 occurred in the 18 reporting hospitals. There were 1047 cesarean sections performed with 75 maternal deaths or 7.15 per cent, one death in 608 deliveries, and a cesarean section incidence of 1 to 44. Comparison of this survey with those of Los Angeles and Brooklyn is shown in Table II.

Other writers have shown what our figures confirm, namely that small hospitals have consistently a mortality rate considerably greater than do the larger maternity hospitals. It would seem that the true figure for each of the three communities is approximately a 7 per cent death rate for cesarean section for all indications and by all methods.

Seven of the 18 hospitals did more than 3000 deliveries each during five years. Table III includes 823 cesarean sections with 54 deaths, or 6.5 per cent. In the 11 remaining hospitals, 224 cesarean sections were done with 21 deaths or 9.4 per cent. (Table III.) Grouping the 18 hospitals according to the number of sections done, Group A, having more than 100 sections each, did 678 cesarean sections with 33 deaths or 4.8

TABLE I. STATISTICS FOR CLEVELAND 1926 TO 1930 INCLUSIVE

HOSPITAL	NO. DELIVERIES	NO. CESAREAN SECTIONS	INCIDENCE CESAREAN SECTION	MATERNAL DEATHS	PER CENT MATERNAL DEATHS	CESAREAN SECTION DEATHS TO NO. DELIVERIES
A	5 yr.—9958	303	1 to 33	18	5.94	1 to 553
B	5 yr.—7190	106	1 to 67	4	3.7	1 to 1797
C	5 yr.—4015	40	1 to 100	5	12.5	1 to 803
D	5 yr.—3900	52	1 to 75	6	11.5	1 to 650
E	5 yr.—3899	53	1 to 73	10	18.8	1 to 389
F	5 yr.—3770	154	1 to 24	3	2	1 to 1260
G	5 yr.—3049	115	1 to 27	8	7	1 to 381
H	5 yr.—1984	21	1 to 94	2	9.5	1 to 992
I	5 yr.—1923	64	1 to 30	9	14	1 to 214
J	5 yr.—1782	15	1 to 119	1	6.6	1 to 1782
K	3 yr.—1274	19	1 to 67	0	0	0
L	5 yr.—1071	48	1 to 22	4	8.3	1 to 268
M	5 yr.—927	23	1 to 40	2	8.7	1 to 464
N	5 yr.—467	6	1 to 78	1	16.6	1 to 467
O	4 yr.—224	8	1 to 28	1	12.5	1 to 224
P	5 yr.—201	7	1 to 29	1	14	1 to 201
Q	5 yr.—276	13.	1 to 21	0	0	0
R	1 yr.—40	0	0	0	0	0
Total Reporting Hosp.	45,650	1047	1 to 44	75	7.15	
Total Area Del.	92,117		1 to 90	2		
S	not obtainable			4		
T	not obtainable			—		
			81 → 1 to 1014 Del. in total area			

Delivery and cesarean section statistics in 18 reporting hospitals in Cleveland registration area in 5 years. Two were nonreporting hospitals. Deliveries and deaths checked at health office.

→ no charts
→ no charts
→ no charts

per cent, while Group B averaged 26 sections each, doing a total of 369 cesarean sections with 42 deaths or 11.4 per cent. (Table IV.)

TABLE II. CESAREAN SECTION. TOTAL MORTALITY OF THREE SURVEYS

CITY	NO. CESAREAN SECTIONS	NO. DEATHS	MATERNAL MORTALITY PER CENT
Cleveland	1047	75	7.15
Brooklyn	1805	128	7.
Los Angeles	1550	73	5.1 Small Hosp. omitted
Totals	4402	276	About 7

Twenty-five or thirty years ago the mortality of this operation was so high, 20 to 30 per cent, that when we thought of cesarean section the paramount risk which we had to consider was that of the operation *per se*. Because of the grave prognosis, the procedure was rarely carried out except for hopelessly obstructed labor. With gradually increasing knowledge of the conditions requisite for safety, the operative mortality decreased and with this improvement came widely extended indications for the operation. The desirability of this increased use of cesarean section has been vigorously disputed by some writers, because the mortality rate of cesarean section is raised and the total number of cesarean section deaths increased. Such statements are unwarranted unless accompanied by evidence that some other treatment of the existing pathology gives as good results. Lowering of total maternal mortality is our purpose, not protection of the statistics of some operation.

The basic or purely operative mortality of cesarean section must be computed upon a basis which excludes deaths from dangerous conditions already threatening the patient's life, and from which she may die no matter how treated. The moment other pathologic entities: cardiac disease, nephritis, infection, etc., appear in the picture precedent to the cesarean section, that moment the statistics contain both cesarean operative deaths and deaths from the already existing pathology. We therefore undertook first a study of the basic operative mortality of cesarean section.

Among the hospitals studied there were four, A, B, F, G, in each of which more than 100 cesarean sections were done during the five years. In none of the other hospitals were these figures approached. For this, and for other reasons such as reliable detailed records etc., we chose the cases in this group as the basis for a study of the operative mortality. To this end we selected all of the cases in which labor had not lasted longer than twelve hours and in which no important pathology existed except some type of mechanical obstruction. (Table V.)

There were 322 cesarean sections on such patients with six deaths, a mortality rate of 1.86 per cent. These may fairly be called operative cesarean deaths. We have shown elsewhere that in Cleveland the mortality rate of low cesarean section is less than half that of the classical procedure. We therefore believe it may be stated that the basic opera-

TABLE III. LARGE VERSUS SMALL HOSPITALS. SEVEN HOSPITALS WITH MORE THAN 3000 DELIVERIES EACH IN THE FIVE-YEAR PERIOD

HOSPITAL	NO. DE- LIVERIES	NO. CESAREAN SECTIONS	CESAREAN SECTION INCIDENCE	MATERNAL DEATHS	PER CENT MATERNAL DEATHS	CESAREAN SECTION DEATHS TO NO. OF DELIVERIES	REMAINING 11 HOSP.
A	9958	303	1 to 33	18	5.94	1 to 553	Del. by Ces. 224
B	7190	106	1 to 67	4	3.7	1 to 1797	Mat. Deaths 21
C	4015	40	1 to 100	5	12.5	1 to 803	Rate 9.4%
D	3900	52	1 to 75	6	11.5	1 to 650	
E	3899	53	1 to 73	10	18.8	1 to 389	
F	3770	154	1 to 24	3	2	1 to 1260	
G	3049	115	1 to 27	8	7	1 to 381	
Totals	35,751	823	1 to 43.5	54	6.5	1 to 662	

tive mortality for Cleveland is in the neighborhood of 2 per cent for the classical and 1 per cent for the cervical operation.

Cervical cesarean section is frequently chosen for potentially infected cases, and should, other things being equal, show a higher mortality than the average. Our records show that the mortality from the cervical operation is less in Cleveland than one-half that of the classical. (Table VI.)

Nine hospitals reported cervical cesarean sections. The totals of these hospitals were 827 classical operations, 63 deaths or 7.6 per cent and 108 cervical, 3 deaths or 2.8 per cent. The four hospitals of Group A make a better showing but emphasize the superiority of the cervical operation. (Table VII.)

TABLE IV. LARGE VERSUS SMALL HOSPITAL

GROUP "A"				GROUP "B"			
HOSPITALS DOING MORE THAN 100 CESAREAN SECTIONS EACH				14 REMAINING HOSPITALS AVERAGING 16 CESAREAN SECTIONS EACH			
HOSPITAL	CESAREAN SECTIONS	DEATHS	RATE PER CENT	HOSPITAL	CESAREAN SECTIONS	DEATHS	RATE PER CENT
A	303	18	5.94	14 Hospitals			
B	106	4	3.7				
F	154	3	2.				
G	115	8	7.				
Totals	678	33	4.8		369	42	11.4

TABLE V. OPERATIVE OR BASIC CESAREAN MORTALITY

	NO. CESAREAN SECTIONS	NO. CASES	MATERNAL DEATHS	RATE PER CENT
Totals	678	322	6	1.86

TABLE VI. CERVICAL VERSUS CLASSICAL SECTION

HOSPITAL	CLASSICAL CESAREAN SECTIONS	MATERNAL DEATHS	RATE PER CENT	LOW CERVICAL CESAREAN SECTIONS	MATERNAL DEATHS	RATE PER CENT	TOTAL CESAREAN SECTIONS
A	280	18		23	0		303
B	104	4		2	0		106
C	35	3		5	1		40
D	47	6		5	0		52
E	49	10		4	0		53
F	108	2		46	1		154
G	95	7		20	1		115
H	63	9		1	0		64
I	46	4		2	0		48
Totals	827	63	7.6	108	3	2.8	935

The hospital having highest percentage of cervical operations also had the lowest total cesarean section mortality, 2 per cent.

Table VIII shows tabulations of recent reports of the two procedures. The selections were made to avoid duplications and we think are representative in character. These figures showing 5.2 per cent mortality in 3468 classical and 2.5 per cent mortality in 2753 cervical operations, are rather convincing and the numbers are sufficiently large to be impressive.

We think of the Porro operation as a cesarean section followed by removal instead of suture of the uterus. We have therefore included these cases in our figures. (Table IX.) There were 22 Porro operations with 3 maternal deaths giving a mortality of 13.6 per cent. In two of

TABLE VII. CLASSICAL VERSUS CERVICAL CESAREAN SECTION
GROUP A HOSPITALS WITH OVER 100 CESAREAN SECTIONS EACH

HOSPITAL	CLASSICAL CESAREAN SECTIONS	MATERNAL DEATHS	RATE	CERVICAL CESAREAN SECTIONS	MATERNAL DEATHS	RATE
A	280	18		23	0	
B	104	4		2	0	
F	108	2		46	1	
G	95	7		20	1	
Totals	587	31	5.3%	91	2	2.2%

TABLE VIII. CLASSICAL VERSUS CERVICAL CESAREAN SECTION
RECENT REPORTS OF SURVEYS AND HOSPITALS

	CLASSICAL CESAREAN SECTIONS	DEATHS	RATE PER CENT	CERVICAL CESAREAN SECTIONS	DEATHS	RATE PER CENT
Cleveland	827	63	7.6	108	3	2.8
Los Angeles	1060	44	4.1	262	13	4.9
Evanston Hosp. Reported by Danforth	57	3	5.2	124	1	0.8
Michael Reese Hosp. Reported by Baer				99	1	1.
Chicago Lying-In Hosp. Reported by Greenhill	147	7	4.76	874	11	1.26
Phaneuf				358	15	4.
C. Jeff Miller				790	23	3.
Quigley	104	2	1.92	61	0	0
N. Y. Nursery and Child's Hosp. Reported by Hawks	492	21	4.3	30	0	0
Jewish Hosp. Brooklyn Reported by Daichman and Ronsheim	529	16	3	36	2	5.5
Philadelphia Lying-In Hospital Reported by Lull	109	7	6.4			
Detroit Survey Weitz	143	19	13.3	11	1	9.
Totals	3468	182	5.2	2753	70	2.5

Cervical section mortality averages less than one-half that of the classical section.

these cases the patients had been in labor more than twenty-four hours, were frankly septic when operated upon, and the septicemia went on to a fatal outcome. The third case was brought to the hospital with a history of repeated hemorrhages. Attempts at delivery outside had produced severe cervical lacerations. A Porro operation was done and cellulitis, pelvic abscess and cerebral embolism ensued.

TABLE IX. PORRO SECTION IN CLEVELAND FOR FIVE YEARS

HOSPITAL	NO. CESAREAN SECTIONS	NO. PORRO OPERATIONS	MATERNAL DEATHS
B	106	1	0
C	40	1	0
F	154	2	0
G	115	17	2
H	21	1	1
Totals		22	3

Maternal death rate 13.6 per cent.

We discovered six attempts to save the baby after the mother's death. Several of these were classified as cesarean deaths at the Health Department office. It is interesting to learn that in five of these the cause of maternal death was eclampsia and that in none of these did the baby live. One anesthesia death was followed promptly by section and the baby survived.

INDICATIONS FOR CESAREAN SECTION

We have grouped the common indications for cesarean section as follows:

1. Mechanical obstruction
2. Previous cesarean for any cause
3. The hemorrhages of late pregnancy
4. The toxemias of late pregnancy

These mortalities must be studied by comparison with the results of other methods of treating the same conditions. Whether the treatment of ablatio placentae by cesarean section raises the mortality rate of the operation, is not important. Whether it raises or lowers the mortality rate of ablatio is the question.

1. MECHANICAL OBSTRUCTION

We have already discussed mechanical obstruction (uncomplicated). Mechanical obstruction complicated with such conditions as prolonged labor, frank infection, accompanying cardiac or kidney lesions, we have not tabulated because the relative importance of the various complications is so varied as to render tabulations of little value. As stated our estimate of the mortality of simple obstruction is 2 per cent for the classical and 1 per cent for the cervical operation.

2. PREVIOUS CESAREAN SECTION

Cesarean section after previous cesarean for any cause. (Table X.)

TABLE X. CESAREAN SECTION AFTER CESAREAN SECTION FOR ANY CAUSE -
CLEVELAND FIVE YEARS

HOSPITAL	NO. CESAREAN SECTIONS	NO. CASES	INCIDENCE	MATERNAL DEATHS	RATE PER CENT	TOTAL DEATHS	RATE PER CENT
A	303	74	1 to 4	4		4	
B	106	23	1 to 5	0		0	
C	40	4	1 to 10	1		0	
D	52	9	1 to 6	0		0	
E	53	7	1 to 8	1		0	
F	154	33	1 to 5	0		3	
G	115	25	1 to 4½	1		1	
H	21	2	1 to 10	0		1	
I	64	9	1 to 7	0		1	
J	15	2	1 to 7½	1		0	
L	48	6	1 to 8	0		0	
Totals	971	194	1 to 5	8	4	10	5

Three of the maternal deaths occurred after rupture of old cesarean section scars. One developed intestinal obstruction from adhesions found at second operation. Primary death rate same as for mechanical obstruction, viz., 2 per cent.

TABLE XI. REPEATED SECTION AFTER CESAREAN FOR ANY CAUSE

CITY	NO. CASES	MATERNAL DEATHS	RATE PER CENT
Cleveland	194	8	4
Los Angeles	197	8	4
Brooklyn	130	1	0.77
Totals	521	17	3¼

Our series shows for Cleveland 194 cases following one or more previous sections for all causes. There were 8 maternal deaths or 4 per cent + mortality. A priori one might think that this class of case would show mortalities in about the same proportion as that of simple obstructed labor. However, 3 of these deaths occurred in connection with a rupture of the uterus in the old cesarean section scar. One developed intestinal obstruction, probably closely related to dense adhesions found at the second operation. One was a syphilitic patient who had previously had four cesarean sections and died of postpartum hemorrhage probably the result of syphilitic changes in the myometrium.

The true operative death rate therefore corresponds closely to that of uncomplicated obstruction, and confirms our estimate of 1 to 2 per cent operative deaths for cesarean section.

Four of these eight deaths were clearly the result of conditions caused by the previous operations. These four deaths should be classified under the heading, "*late or delayed mortality of cesarean section.*" In this

series it equals the primary basic or operative mortality of 2 per cent. Viewed from this standpoint the true mortality of cesarean section is 4 per cent.

These deaths emphasize the necessity for the operator, who is considering pelvic *versus* abdominal delivery in a young woman, to weigh carefully the late or delayed mortality of the operation.

3. HEMORRHAGES OF LATE PREGNANCY

Placenta Previa.—A. H. Bill last year presented reports from 4 large clinics including his own with a total of 262 cases, treated chiefly by cesarean section, with a maternal mortality of only 1.78 per cent. Bill stressed the value of transfusion preceding or during the operation. In

TABLE XII. CESAREAN FOR PLACENTA PREVIA CLEVELAND FIVE YEARS

HOSPITAL	NO. CESAREAN SECTIONS	NO. CASES	MATERNAL DEATHS	FETAL DEATHS	MATERNAL DEATH RATE PER CENT	FETAL DEATH RATE PER CENT
A	303	57	2	12	3.5	21.4
B	106	3	0	0	0	0
C	40	7	0	0	0	0
D	52	10	2	3	20.	33.4
E	53	11	1	3	9.1+	27.4
F	154	8	0	3	0	37.5
G	115	22	1	6	4.5+	27.4
H	21	5	0	1	0	20.
I	64	9	1	1	11.4	11.4
J	15	1	0	1	0	100.
L	48	4	0	1	0	25.
Totals	971	137	7	31	5	22.5

Cases 137. Maternal deaths 7. Maternal death rate 5 per cent. Total deaths 31. Total death rate 22.5 per cent.

TABLE XIII. CESAREAN SECTION FOR PLACENTA PREVIA
CLEVELAND HOSPITALS SEPARATED INTO GROUP "A" AND "B"

GROUP A MORE THAN 100 SECTIONS EACH				GROUP B ALL OTHER HOSPITALS DOING SECTIONS FOR PLACENTA PREVIA			
HOSPITAL	NO. CASES	MATERNAL DEATHS	RATE PER CENT	HOSPITAL	NO. CASES	MATERNAL DEATHS	RATE PER CENT
A	57	?		C	7	0	?
B	3	?		D	10	2	?
F	8	?		E	11	1	?
G	22	?		H	5	0	?
				I	9	1	?
				J	1	0	?
				L	4	0	?
Totals	90	3	3 1/3		47	4	8.9

Most of the series of placenta previa cases reported in the literature are from large clinics and should be compared with our Group "A." 3 1/3 per cent should therefore be compared to 9 per cent as shown for other methods of treatment.

the same presentation he collected a series of 2117 cases, all recent, and reported by competent operators with large clinics, in which version or bags were chiefly used. This series showed a mortality of 9.68 per cent.

Our Cleveland survey shows a 5 per cent cesarean section death rate for placenta previa in all hospitals large and small. (See Table XII.) Separating into Groups A and B, we find Group A hospitals with more than 100 cesarean sections, each had a maternal mortality of only 3 1/3 per cent, while Group B including all other hospitals doing cesarean section for placenta previa had 8.9 per cent of deaths. (Table XIII.)

The three general surveys show an average maternal death rate for placenta previa of 6 per cent. The mortality rates for the three com-

TABLE XIV. CESAREAN SECTION FOR PLACENTA PREVIA
THREE SURVEYS

CITY	CASES	MATERNAL DEATHS	RATE PER CENT
Cleveland	137	7	5
Brooklyn	98	7	7
Los Angeles	68	4	6
Totals	303	18	6

Note how closely the three community figures correspond.

TABLE XV. CESAREAN SECTION FOR ABLATIO PLACENTAE
CLEVELAND FIVE YEARS

HOSPITAL	NO. CESAREAN SECTIONS	NO. CASES	MATERNAL DEATHS	RATE PER CENT	FETAL DEATHS	RATE PER CENT
A	303	10	1	10	5	50
B	106	2	0	0	0	0
C	40	1	0	0	1	100
E	53	2	0	0	0	0
F	154	5	0	0	2	37.5
G	115	7	0	0	2	28.5
H	21	3	0	0	1	33.3
Totals	972	30	1	3 1/3	11	37

munities are consistently close together and probably represent the general average. We must emphasize, however, that this is an average rate for hospitals large and small with services both good and not so good. (Table XIV.)

This of course does not represent the best that can be done for placenta previa with cesarean section. As shown above, our four hospitals in Group A had only 3 1/3 per cent maternal deaths. We concur in Bill's conclusion that cesarean section is the best treatment for placenta previa unless the cervix is well dilated.

We wish again to point out that although the increasing use of cesarean section for placenta previa produces a rise in the death rate of the operation, it nevertheless means an actual reduction in total maternal and fetal mortality and is therefore a conservative procedure.

Ablatio Placentae.—The total number of cases of ablatio placentae found in our Cleveland series was thirty with one maternal death, 3 1/3 per cent. (Table XV.) Thompson reported from Los Angeles 25 cases with 2 deaths, while Gordon in his Brooklyn report found 19 cases with no deaths. (Table XVI.)

TABLE XVI. CESAREAN SECTION FOR ABLATIO PLACENTAE: 3 SURVEYS

CITY	CASES ABLATIO PLACENTAE	MATERNAL DEATHS	RATE PER CENT
Cleveland	30	1	3 1/3
Brooklyn	19	0	0
Los Angeles	25	2	8
Totals	74	3	4

Maternal death rate surprisingly low.

The three surveys show a total of 74 cases of ablatio treated by cesarean section with three maternal deaths or 4 per cent. The one fatal case in the Cleveland group was in grave condition from hemorrhage when admitted to the hospital.

Polak reported last year 16 cases of ablatio with only one cesarean section and only one death which followed manual dilatation and version with rupture. He rather favors expectant treatment. His figures are good, but it is to be remembered that his report is from one clinic, well organized and with excellent supervision, while the data in our survey are taken from all the hospitals of the community. We think the evidence still favors cesarean section for this condition unless the patient will deliver or can easily be delivered without delay. We concur in his opinion that the value of transfusion for these cases should be emphasized.

4. TOXEMIAS OF LATE PREGNANCY

Eclampsia.—Cesarean section is not a popular treatment for eclampsia in Cleveland, and a detailed inspection of the charts year by year shows that its frequency is diminishing.

There were 45 eclampsia cases so treated in five years in Cleveland in all of the reporting hospitals. The outcome was fatal in 9 cases, giving a mortality rate of 20 per cent. (Table XVII.) Comparing this with the two other surveys, we find Los Angeles with 46 cases and 13 deaths or 28 per cent and Brooklyn with 104 and 27 deaths or 26 per cent. The total figures of the three surveys show 195 cases of eclampsia treated by cesarean section with 49 deaths or a total mortality of 25 per cent. (Table XVIII.)

These figures merely confirm many previous reports in recent years showing that this operation does not cure eclampsia. Surprisingly enough, our rate of 25 per cent is the same as that reported by Peterson many years ago in a group of 500 cases collected from the literature.

TABLE XVII. CLEVELAND ECLAMPSIA CESAREAN SECTIONS

HOSPITAL	NO. CESAREAN SECTIONS	NO. CASES ECLAMPSIA	CESAREAN SECTION INCIDENCE OF ECLAMPSIA	PER CENT RATE ECLAMPSIA	MATERNAL DEATHS	PER CENT MATERNAL DEATHS	FETAL DEATHS	PER CENT FETAL DEATHS
A	303	9	1 to 34	3.	1	11	2	22.
B	106	2	1 to 53	1.8	0	0	0	0
C	40	1	1 to 40	2.5	1	100	1	100.
D	52	3	1 to 17	6.	0	0	0	0
E	53	9	1 to 6	17.	2	22	0	0
F	154	7	1 to 22	4.5	2	28	1	14.3
G	115	2	1 to 57	1.7	0	0	1	50.
H	21	5	1 to 4	25.	1	20	2	40.
I	64	6	1 to 10	10.	2	33⅓	3	50.
J	15	1	1 to 15	6⅔	0	0	0	0
Totals	923	45	1 to 20	5.	9	20	10	22.

Eleven Hospitals doing 923 sections, 43 were for eclampsia. Maternal deaths in eclampsia cases 9. Maternal death rate for eclampsia 20 per cent. Fetal death rate in eclampsia 22 per cent.

Detailed study of the records shows that usually these cases go steadily onward to an eclampsia death, unrelieved by the operation. Apparently the interruption of the pregnancy (the underlying cause of eclampsia) does not compensate for the cessation of vigorous eliminative treatment, necessitated by a laparotomy.

TABLE XVIII. CESAREAN SECTION FOR ECLAMPSIA: 3 SURVEYS

CITY	CASES	DEATHS	DEATH RATE PER CENT
Cleveland	45	9	20
Brooklyn	104	27	26
Los Angeles	46	13	28
Totals	195	49	25

Death rate of cesarean section after convulsions (eclampsia) is four times that of the same operation before convulsions. (See Table XIX.)

Probably the deleterious effect of general anesthesia is a large factor in producing such poor results. However, in our two fatal cases spinal anesthesia was used with no better outcome. The Chicago Lying-In Hospital reports 16 cases with only one death. This is better, but the number of cases is too small to permit of any conclusions. For the present the evidence is strong that delivery by laparotomy must go, as did accouchement forcé, in cases where convulsions have already occurred.

PREECLAMPTIC TOXEMIA

We have made no attempt to separate into the various types, the toxemias of late pregnancy whose terminal phase is convulsions, but have designated all of them under the old term of preeclamptic toxemia.

We found an entirely different prognosis for preeclampsia treated by cesarean section, in our Cleveland survey, and the results of the 3 surveys are in complete accord. (Tables XIX and XX.)

TABLE XIX. CESAREAN FOR PREECLAMPTIC TOXEMIA
CLEVELAND FIVE YEARS

HOSPITAL	SECTIONS	NO. TOXEMIAS	RATE PER CENT	MATERNAL DEATHS	RATE PER CENT	FETAL DEATHS	RATE PER CENT
A	303	24	8.	2	8	2	8 $\frac{1}{3}$
B	106	6	5.5	0	0	1	16
C	40	3	7.5	0	0	1	33
D	52	5	10.	0	0	1	20
E	53	6	11.5	1	17	1	17
F	154	9	6.	0	0	2	22
G	115	9	8.	0	0	1	11
I	64	2	3.	0	0	0	0
J	15	2	13.	0	0	0	0
Totals	902	66	7.3	3	4.5	9	13.5

Cesarean section for preeclamptic toxemia, 66 cases. Maternal deaths 3. Maternal death rate 4.5 per cent. Fetal deaths 9. Fetal death rate 13.5 per cent.

Cleveland had in this series 66 cases of cesarean for preeclampsia. There were 3 maternal deaths or 4.5 per cent. Los Angeles had 187 cases with 11 deaths or 6 per cent, while Brooklyn had 106 cases, 7 deaths, or 6.6 per cent.

TABLE XX. CESAREAN FOR PREECLAMPTIC TOXEMIA: THREE SURVEYS

CITY	CASES	MATERNAL DEATHS	RATE PER CENT
Cleveland	66	3	4.5
Brooklyn	106	7	6.6
Los Angeles	187	11	6
Totals	359	21	6

Death rate one-fourth that of the same operation after convulsions.

The totals are 359 cases, 21 maternal deaths, an average rate of 6 per cent. We might add to this Greenhill's report from the Chicago Lying-In Hospital, of 85 cases with one death. This makes a total of 444 cases of preeclampsia with 22 maternal deaths or 5 per cent. Just why cases which have advanced to the convulsive stage should show such strikingly worse results than the preeclampsias is not quite clear.

At St. Luke's we never do a section for preeclampsia until a thorough test of medical treatment in the hospital has proved ineffective. We have long believed and taught that the best criterion for prognosis in these toxemia cases is not the quantity of albumin, nor the height of the blood pressure, but the resistance of the disease to proper treatment. We presume that this is the case in most maternities with good supervision. Cesarean section is therefore probably done in well regulated clinics only in selected highly resistant although less advanced cases.

We should of course expect better results in these cases than in the eclampsias, but the difference between 5 per cent or 6 per cent and 25 per cent is rather astonishing. We therefore believe that a severe preeclamptic who under vigorous well directed medical treatment in the hospital becomes progressively worse should be treated by cesarean section without undue hesitation or delay.

When one considers the fact that most of the cases of pulmonary embolism, of thrombosis and infarction following cesarean section are septic in origin, it becomes apparent that we might well add the cases in this group to those listed as septic. The total of the two groups is 44.

TABLE XXI. CESAREAN DEATH RATE FROM COMMON INDICATION AS SHOWN BY OUR SUMMARY

Uncomplicated obstructed labor	1.86
Cesarean following previous section	4.
Ablatio placentae	4.
Placenta previa	6.
Preeclamptic toxemia	6.
Eclampsia (preoperative convulsions)	25.

One-half of all the deaths following cesarean section in our series are therefore chargeable to septic infection in some form. We believe that the more general use of the cervical operation by competent operators would reduce the number of these deaths, especially those due to peritonitis.

TABLE XXII. CAUSES OF DEATH, CLEVELAND AREA FOR FIVE YEARS

Septic infection and peritonitis	32	
Embolism, thrombosis, infarction	12	
Total sepsis		44
Eclampsia	12	
Hemorrhage	7	
Pneumonia	5	
Cardiac	4	
Surgical shock	4	
Intestinal obstruction	2	
Strangulated hernia	1	
Acute gastric dilatation	1	
Not obtainable	1	
Total	81	

Eclampsia is the next most frequent cause of death. Our leading obstetricians are quite uniformly of the opinion that cesarean section is rarely indicated in the treatment of this condition. Some of these 12 lives might probably have been saved had medical treatment been adopted instead of surgical.

CONCLUSIONS

1. The primary or basic operative risk of the cesarean operation is high (one to two per cent). There is also a definite *late* or *delayed* mortality present with every pregnancy and labor occurring after one cesarean section. These considerations make the decision to perform the operation a grave one. The risk is real even under favorable circumstances.

2. However, statistics such as are being published from time to time showing the rapidly mounting number of deaths following cesarean section, should not be used as evidence that the operation is being abused. Such statistics merely show the more general use of this procedure in the treatment of grave pathologic conditions complicating pregnancy and labor. Reasoning of this type would prove diphtheria antitoxin a dangerous remedy.

3. The advisability of cesarean section for placenta previa, ablatio placentae, preconvulsive toxemia, etc., can be determined only by comparison of the results, with those obtained by other methods of handling the same conditions. The mature trained judgment of an expert obstetrician is necessary for such a decision.

4. In our series the low or cervical operation gives a definitely lower mortality rate than does the classical. We advise its use in all poten-

tially infected cases. In those with definite sepsis the Porro should be considered.

5. This series shows as do preceding ones, that the mortality following cesarean section for eclampsia is unjustifiably high. It is not good treatment for this condition.

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(For discussion, see page 277.)

WHAT IS CONSERVATISM IN THE TREATMENT OF NEISSERIAN INFECTION?

BY D. R. HUGGINS, M.D., PITTSBURGH, PA.

THE time when gonorrhea became the heritage of the genital tract in man and woman is uncertain. It may have accompanied the gradual evolution of the race. Its effects and clinical signs were described in the dawn of history. Fuller knowledge of its cause and a better understanding of its terrible effects followed the discovery of the gonococcus in the latter half of the nineteenth century, and the views of Noeggerath remain unchallenged to a very large degree. The development of abdominal surgery and the work of the pathologist during the last century have shown us the picture in its true light. While we are just as helpless as ever, so far as any cure in a bactericidal way is concerned, we have made distinct advancement in a general knowledge of the habits of this disease as it affects the genital tract of women. In the discussion of this subject, I do not wish to be misunderstood. So often a slight departure from the beaten path which sounds either more radical or more conservative is condemned without careful analysis. The main points are thus overlooked so that the effort to classify some of the factors in a difficult subject is entirely lost.

One of the most interesting things about infection of the fallopian tubes is the marvelous change that may take place in the course of this disease. From a simple inflammatory change with redness and the presence of free fluid in the pelvis during the first few hours of an acute infection, the picture changes rapidly and the extent of involvement within a few days may be so great that the tubes become enormously swollen and the entire pelvis blocked with exudate. One can never forecast the extent of a given infection at its onset. Both ovaries are usually involved to a certain degree and often one or both entirely destroyed before the extending infection becomes finally blocked. This picture is so common that it need only be mentioned. We must agree that it is a serious factor in the future health of a young woman, especially from the standpoint of disturbed ovarian function. Previous to the time when abdominal surgery exposed this field to the light of day and by the removal of these infected tubes cured those unfortunate victims, this

form of suffering among women was very great. During the acute stage, it was called inflammation of the bowels, and early medical history reveals the frequency of recurring attacks followed by chronic invalidism. Over fifty per cent of the surgery on the pelvic organs of women may still be credited to this disease. During the latter half of the last century, Sinclair, Lawson Tait and others placed the cure of this disease on a solid surgical basis and gave relief to a class of patients which up to that time were doomed to chronic illness. A careful study of histories of patients as related by these men reveals the same problems as we find today, and we may learn much by a careful study of their work and final conclusions. They encountered much opposition among medical men who criticized them as being too radical. It is but natural that for a period of years operations were suggested and done at times which were not to the best interest of the patient and as a consequence both mortality and morbidity were much higher than necessary. It led to operations at all stages of the disease and an unnecessary sacrifice of ovarian tissue.

We come to another very important landmark when it was recognized that it is much better, for obvious reasons, to defer operation until the active symptoms have subsided than to operate during the course of an acute attack. Much credit is due to Dr. F. F. Simpson of Pittsburgh for his pioneer work in this field. It brought a much needed change in the attitude of gynecologists and a healthy conservatism which has been productive of great good. With it, however, there have grown certain ideas and tendencies which need to be carefully scrutinized before finally accepted as conclusive facts in this important subject.

It is a foregone conclusion that a certain percentage of acute infections of the fallopian tubes recover entirely from a primary attack and that normal function returns. Pregnancy occurs and a normal delivery and puerperium follows. It is for this reason that operation should never be considered either during or following the first attack. It is here that conservative measures are indicated and recovery from the acute symptoms often occurs. It is well known, however, that all cases do not make a complete recovery. Often the disease becomes quiescent for a time and then recurs. During the interval, the patient does not completely regain her health, but continues under a handicap as a result complaining of pelvic soreness, backache, nervousness and chronic fatigue. Acute exacerbations with confinement to bed over a period of years becomes a great burden to the woman in poor financial circumstances. It is not only the physical suffering, but the constant financial drain that adds to the trouble. It makes no difference whether they are cared for at home or admitted to the wards of the hospital, the enormous expense of medical care becomes a great economic problem. Not only is the financial question a serious one. There is no doubt that a per-

sistent infection over a period of years finally interferes seriously with the general health of the patient. The chronic inflammation has a disturbing influence on ovarian function because the ovaries become secondarily diseased. It is a state of semi- or complete invalidism in many women on account of pain, fatigue, and nervousness. It seems to have become the habit to treat these patients in a so-called conservative way, not only during the acute stage but to continue to treat them through attack after attack with the idea that such conservatism is to the best interest of the patient. This is done apparently because they are able to go about and have acquired a certain tolerance to their symptoms. There seems to be an impression among medical men that these patients have recovered, and much stress is placed in some of our clinics upon the value of certain kinds of palliative treatment. A cure is oftentimes proclaimed as a result of some particular form of treatment when there is only a temporary quiescent period of the disease which will come from a period of rest or is perhaps the natural improvement which comes in the course of the chronic stage of this infection. While the acute symptoms may subside, such as pain, etc., on careful observation it will be found that the patient is still below normal on account of fatigue, nervousness and backache secondary to the low-grade infection which still persists even in the absence of all active symptoms.

The persistent effect from this chronic form of absorption over a period of years is not to be considered lightly and this particular feature of this disease should lead to the consideration of a removal of the tubes before the patient finally becomes a nervous wreck. Just why in a given infection, where there is only a mild involvement of the tubes, there is marked cirrhotic change in the ovarian structures with serious effects upon the function, is difficult to understand, for in others the inflammatory change may be much worse in both tubes and ovaries without much disturbance in the normal physiologic action. To the close observer cases of this kind are not infrequent and really have much to do with the suggestion that this subject should be carefully reviewed from the standpoint of what we are aiming at now in the way of preventive medicine.

A woman in good financial circumstances, and who desires to bear children, may be treated in this manner over a period of years, but it should be explained to her that the only way to complete recovery is through the removal of the tubes. It is then for her to decide whether her desire for children justifies a life of invalidism in the hope of conception which at best may be speculative. She is also entitled to the knowledge that with each succeeding year, there is greater danger of ovarian dysfunction and with every acute attack, the possibility of complete destruction of these organs. This decision should not rest with the gynecologist, but with the patient after she is made acquainted with the facts.

If any progress has been made in the last fifty years in the way of cure in these infections my remarks would be unnecessary. Aside from rest in bed over a period of weeks there is no palliative treatment that is of permanent value despite the claims of individuals from time to time as to the curative effects of certain procedures. So long as this disease has been known it has acted in the same manner. Some patients get well, others improve if allowed to rest for a sufficient period of time. The value of vaccine injections, of mild heat, light, and other things in a therapeutic way has been greatly exaggerated and these procedures are of no permanent good.

There is a time in the course of individual cases where we continue to treat them year after year without permanent relief when so-called conservatism becomes extremely radical in so far as effects are concerned. It is here that treatment should not be carried on without careful consideration of all the factors involved. It is not true conservatism to allow a patient to drift on into a state of semi- or complete invalidism unless she, after a full knowledge of the consequences, still persists in such a course. It is not economic but is wildly extravagant, both from the standpoint of health and finance. Some of the points in this discussion are brought out in the histories of two cases which clearly emphasize the responsibility, both from economic and health standpoints. Such patients are by no means scarce, and while the study of case reports is time consuming, yet they are often most convincing.

CASE 1.—A young woman, twenty-three years of age, had a sharp attack of salpingitis three years previous to her admission to the hospital. She was confined to bed for a period of two or three weeks but made a good recovery, so far as local complaints are concerned. Tracing her history carefully it soon appeared that she has never been as well as she was previous to this attack of pelvic inflammation. She complained of being tired and unable to perform her usual work without fatigue. So far as any pain, however, except an occasional slight twinge, she had none, but it was not difficult to determine that there was definite impairment of her strength and health. Two weeks previous to admission she had a recurrence of symptoms similar to her former illness, including severe pain in the pelvis, more particularly on the left side.

Examination revealed the presence of a marked cervicitis with a wide area of erosion. There was fixation of the left tube and ovary with some enlargement. The right tube was extremely sensitive but not palpably enlarged. Her temperature soon came to normal after admission. In view of the age of this patient and the great probability that if any operation was undertaken it would mean a sacrifice of her tubes, the subject was plainly discussed with her. It was explained that if she had the operation it would probably mean the loss of the tubes and subsequent sterility. It was also explained to her that no form of palliative treatment that we know at the present time would give her any permanent and sure relief; that her symptoms would probably continue with exacerbations from time to time and with a certain handicap, in so far as her general health was concerned. It was also explained to her that the longer this infection persisted the greater the likelihood of permanent disease of the ovarian structure. She was the main support of the family, her mother being a widow,

and one of her main considerations was the maintenance of capacity to work. It was explained to her that she might not have another attack for some time and that the handicap might not be any greater for the next two years than it had been in the past. All of these points were carefully discussed in order that she might be able to determine her own course of action as judged from her own conception of the amount of the pain, tenderness, and physical handicap that she experienced from day to day. It is only by such a course that any decision can be arrived at because in our opinion every patient has the right to determine, after she has full knowledge of the probable course of a disease, as to whether she will accept the hazard of the operation or continue in a palliative way with the hope that the infection may die out. She chose to be operated upon.

At operation the left tube was found markedly enlarged and adherent. The ovary consisted only of a shell of ovarian tissue, containing about 6 c.c. of pus. The right tube was not very much enlarged but a few cobweb adhesions surrounded the fimbriated extremity. The right ovary was about twice the normal size, containing some small cysts, and its consistency very much harder than normal, indicating the presence of considerable fibrous change in its structure. It was, of course, necessary to remove the left adnexa. To have left the right tube would not only mean a continuation of the infection but the great risk of complete destruction of the right ovary, a calamity to any woman of her age. The right ovary was not removed.

CASE 2.—Age twenty-two years. This patient was admitted to the Elizabeth Steel Magee Hospital on October 22, 1928, complaining of severe dysmenorrhea preceding menstruation and following it for ten to fourteen days. This has been present for the past eighteen months. She began to menstruate at the age of fourteen and was regular every twenty-eight days until the onset of the present complaint eighteen months ago. She is now irregular and the intervals between her periods vary from one to three months. The duration previous to the present illness was from four to five days. It now varies from six to fourteen days and the pain is gradually increasing in severity and length. She had been married for three years. Had one pregnancy which ended in a miscarriage eighteen months ago at the fifth month. This was followed by an illness which confined her to bed for two months. It was accompanied by an elevation of temperature. At the time of her admission the right adnexa was slightly enlarged, of limited mobility, and tender. Left adnexa was moderately tender, but no fixation or definite enlargement could be determined. Diagnosis: chronic bilateral salpingitis with oophoritis.

On account of the youth of the patient, together with the fact that she was quite desirous of having children, it seemed advisable after cauterizing the cervix to keep her under observation with the advice as to rest, etc., hoping that pregnancy might occur. An iodipin test made at this time indicated patency of the tubes.

This patient was again admitted to the hospital on July 20, 1931 with the following history:

For some time after her dismissal from the hospital three years ago she felt somewhat better. She then began to experience dull aching lower abdominal pain. The pain was bilateral and at times associated with backache. It was aggravated by exertion. She has had some vaginal discharge. Patient has been pregnant but once, as indicated in the history of her previous admission. One of her principal troubles at the present time is pain previous to and following menstruation, which is gradually increasing in severity. It generally precedes the flow for a week and sometimes lasts for ten or twelve days afterward. During the last two years the interval between menstruation has been increasing. Her

last menstrual period was four months ago. The patient was still extremely anxious to become pregnant.

Examination revealed the presence of a marked sensitiveness along the course of both fallopian tubes and ovaries. There was a definite sense of resistance, more especially on the left side, which indicated the presence of fixation of the fimbriated ends of the tubes and ovaries. The uterus was movable, but there was great sensitiveness in the cornua on both sides and in spite of the absence of enlargement, definite tenderness was present between the uterus and ovaries along the course of the tubes. The history of persistent sterility, a gradual increase in the dysmenorrhea for the past two or three years, with disturbed menstrual function, all pointed toward the existence of a low grade chronic salpingitis associated with chronic oophoritis. The gradual increase in the time between her menstrual periods suggested a progressive destruction of ovarian tissue from chronic inflammation. This patient was a typical example of the effects of gonorrheal infection of the tubes over a period of years, in this instance particularly unfortunate on account of the great desire for children.

While a careful review of her history and physical findings would seem to indicate that this patient complained to a considerable extent, it is interesting to note that one of her main reasons for returning to the hospital was a question of sterility. While she complained of some soreness and pain and irregular menstruation, these symptoms were really brought out more prominently by careful interrogation. In her great desire for children she placed only a moderate degree of stress upon these symptoms. This was true to so great an extent that the question arose of a possible case of endocrine disturbance with indications for glandular therapy. After a careful review of the whole subject with the patient, explaining to her the cause for her pain and telling her that an exploratory laparotomy might reveal a condition which would result in the loss of her tubes, she stated that after all what she most needed was to get well.

Operation—The uterus was found to be symmetrical, small, and of the hyperinvolted type. It was in good position and movable but its consistency was much firmer than that of normal. The tubes were thickened and contained a great excess of fibrous tissue. A few fine adhesions were attached along the serosal surface of each tube. The left ovary was enlarged owing to the presence of follicular cysts. Both ovaries were surrounded by dense fibrous adhesions which completely fixed the position of both ovaries and were separated with great difficulty. After freeing the adhesions about the ovaries, both tubes were removed.

A study of this case from its onset is extremely interesting from the standpoint of the damage to ovarian tissue from chronic adjacent infection, and represents a type of patient which is not unusual and one that must receive careful study and consideration some time in the course of the disease before the injury is beyond repair.

These patients represent types commonly seen and where we are inclined to postpone operative treatment from year to year, largely because of the great desire to conserve the fallopian tubes. There is no question that if a young woman would rather bear her ills and continue from time to time to have attacks of pain, every possible effort should be made to cooperate with her in any form of palliative treatment one may adopt. Every woman has the right to the chance of childbearing, even though the tubes may seem in a hopeless condition from that standpoint. She also has the right to speculate as to what may happen to the ovarian tissue and she has the right to under-

stand the problem as it exists and it is our duty to explain to her without prejudice and without opinionated conclusions as to the exact course of the disease and the probable consequences, if operation is not performed. The question of economy and home responsibilities are factors appreciated and understood oftentimes only by the patient herself and it is upon her, after the whole problem has been presented, that the responsibility must lie. We must not forget that the best interests of the patient must be served.

The habit of certain operators in removing one tube and ovary in the presence of a bilateral chronic salpingitis with the idea, perhaps, of saving the tube for a possible future pregnancy, or with the idea that the infection may subside, is a matter of serious concern. There is sound philosophy, if the tube is preserved, in the hope of future pregnancies, but where the history shows a chronic infection, which is bilateral, and where the patient has been having pain and repeated attacks of acute exacerbations, it certainly is of doubtful benefit with any other hope than that of possible conception. We are constantly seeing and operating upon patients where one tube and ovary have been removed, but the patient goes on with the same symptoms and finally comes to operation at a time when not only the tube must be removed, but the ovary as well, either on account of chronic fibrosis or the presence of an acute ovarian abscess. We have recently witnessed such an example in a large clinic, the history in the case being that of a chronic illness, symptoms entirely confined to the pelvis, and bilateral. When the abdomen was opened both adnexa were adherent, the left, perhaps, to a less extent than the right, but a hopeless condition from the standpoint of recovery. The right adnexa were removed, the adhesions separated about the left and the abdomen closed. In this instance the subject of future pregnancies was not the outstanding excuse for the retention of a diseased tube, but it was left because the operator considered the possibility of the infection dying out. This has become common practice. It has a widespread influence upon members of the profession whose experience does not seem to convince them that it is only a question of time until such an abdomen must be reopened, and perhaps at a time when the pathology has progressed to a much more serious degree. Such practice may be rational, if pregnancy is the outstanding hope, but to do it with the idea that the infection may disappear in these chronic cases, is not based upon unbiased judgment.

There is another phase of this subject that should be discussed because there is serious doubt that the final word has been said about the danger in operation within the first twenty-four hours of the onset of acute salpingitis. In our experience there is no greater danger and perhaps less in the removal of infected tubes within the first twenty-four hours of the onset of the infection than there is in the operation for an acutely in-

flamed appendix. The field is even a safer one at that stage of the disease. It is undoubtedly true that if further time has elapsed, with the rapid spread of the infection, pus formation, and extension into the lymphatics of the broad ligaments, the operation becomes increasingly dangerous. It is our conclusion that in a case where previous attacks have occurred and where the history shows that the patient has not been entirely free from symptoms between the attacks that in many instances it would be much better to operate at once just as we do for acute appendicitis. Otherwise it means only the waste of another period of time in bed, but it may also mean the formation of a tuboovarian abscess with its consequent disturbance to the welfare of the patient's health for several years to come. It should be repeated that this should never be done in the first attack or perhaps in the second or third, but that it does obtain in certain instances where the factors above mentioned are present. With advancing years this is particularly true for, with lowered resistance, there is greater danger of a more severe extension of the infection and consequently the disease is much prolonged. This is true after the age of forty and our experience has been such that we prefer to operate upon all such patients within the first twenty-four hours of the onset and do it with the feeling that the patient will escape many weeks of an illness that is uncertain in its outcome, both as to life and serious involvement of other organs. This is because of lowered resistance which is more marked as the time of the menopause is approached. These ideas indicate the value of the importance of different forms of treatment in selected cases, and it is our conclusion that if we could only see the case within the first few hours of its onset that the progress of the disease would be halted, the patient saved weeks of illness and the prognosis as to operative mortality just as good. The danger of operation at this time has been much exaggerated. Such a course will necessitate earlier and more definite decisions on the part of the practitioner of medicine so that such patients may be referred immediately for operation. The history is a distinct aid in such a diagnosis.

CONCLUSIONS

We are at the threshold of preventive medicine. It is the duty of the physician today to practice medicine that truly conserves, and it is being done constantly in all branches of medicine. To keep people at the highest state of health and happiness is our responsibility. It is no longer considered unusual to remove tonsils, gall bladder, or appendix as foci of infection in order to relieve rheumatism or to prevent chronic disease of the myocardium. It is the duty of the gynecologist to keep in line and not to allow his vision to become entirely clouded by recoveries which are often only partial, and when persistent, delay means great loss to the individual.

ABDOMINAL TOTAL HYSTERECTOMY

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SINCE hysterectomy has become the routine treatment for a number of benign diseases of the adnexa and uterus, especially fibroids, the question of whether the subtotal or supravaginal hysterectomy or the total hysterectomy is more efficient and advisable, has been discussed many times.

At the very beginning of the development of operative technic, the subtotal hysterectomy was the method of choice, favored for its greater facility and for the security of the ureters, which at that time constituted for the surgeon a constant menace during the extirpation of the cervix. The advanced knowledge of pelvic anatomy and increased operative skill have reduced such accidents, so that the panhysterectomy has become more and more popular. Clinical investigations have shown that in spite of the greater facility, good results can be obtained by the subtotal hysterectomy only in selected uncomplicated cases. In cases of necrotic, secondarily infected tumors, pus tubes, after separation of adhesions resulting in bleeding, and the impossibility of perfect hemostasis, the total hysterectomy has been found preferable, securing as it does ideal drainage through the vagina. In spite of being handicapped by a selection of complicated cases with a higher operative risk, the difference in mortality between total and subtotal hysterectomy is so small that it can practically be neglected.

Even admitting that the subtotal hysterectomy may be easier, the report of the steadily increasing number of cases in which cancer has developed in the cervical stump is a serious warning against the routine use of the subtotal hysterectomy, particularly in a country where more has been done in research work and skillful propaganda against cancer than in the rest of the world.

Table I, while not including all the reported cases, shows that the incidence of cancer in the cervical stump after supravaginal amputation is very frequent. Since Chrobak of Vienna reported the first cases in 1896, 169 cases have been recorded in Germany up to 1925, while in 1921 Polak was able to collect 256 cases from the American literature alone, and 900 cases altogether. The reason for the large number in this country may be attributed partly to the more general use of subtotal hysterectomy, partly to a higher frequency of cancer. Hochmann estimates the frequency of this complication at 0.27 per cent, Polak and Sharples at 2 per cent. It does not make the least difference, either for the woman who has unfortunately become a victim or for the operator who is justly

responsible for it, whether this complication may be expected in 2 per cent or 10 per cent.

The fact that probably thousands of women develop a cancer of the cervix after subtotal hysterectomy and that every woman after such an operation is threatened by this danger makes it imperative that we abandon this inefficient operation.

TABLE I. CANCER OF CERVIX AFTER SUBTOTAL HYSTERECTOMY

<i>German Literature</i>			
Sanders	102		
Isbruch	65		
Fleischmann	2	Total 169	
<i>American and English Literature</i>			
J. O. Polak	256		
R. T. Frank	1		
W. F. Shaw	3		
S. S. Hochmann	3	frequency	
		0.27 per cent	
James C. Masson	29		
Charles Mayo	70		
C. W. Sharples	3	estimated frequency	
		2 per cent	
A. Stein	2		
L. Branscomb	46	Total 413	
Total of published cases	532		

In perfect agreement with Masson and Mayo in this country and with Ott and Weibel and others in Europe, I feel that a total hysterectomy should be performed as a routine and that there is no reason why the stump of the cervix should be left. It is functionally worthless and quite frequently even in the absence of disease previous to operation develops a more or less profuse discharge so often refractory to treatment (Masson).

It is true that both cervicitis and cancer can be reduced in frequency by thorough cauterization of the cervical canal to destroy the mucosa; but they are not absolutely eliminated, as cancer can originate from the squamous-cell epithelium of the vaginal surface of the cervix. Those who do not want to give up entirely the supravaginal amputation claim that it is important for every such patient to be followed carefully for the rest of her life.

The simplest and most efficient way to take care of the cervical stump is, as Doederlein says, its primary removal.

There are practically only two conditions in which partial removal of the uterus or its supravaginal extirpation is justified in favor of the patient: the possibility of preserving the menstrual function in young women by leaving some mucosa of the uterine body in order to prevent psychic depression and inferiority complex; and the extremely rare emergency cases in which the patient's life may be dependent upon

greater speed, as in cases of rupture of the uterus or in the sudden development of a serious reaction during operation.

The authors, who, in spite of the danger of the later development of cancer, advocate subtotal hysterectomy support their opinion mainly by the following three arguments:

First, a shortening of the vagina after total hysterectomy resulting in interference with intercourse. Against this argument it can be said that the vagina never shrinks so long as the ovarian function is sufficient. Actual operative shortening can be avoided by removing the cervix close to its insertion into the vagina. Furthermore, we know by experience that even considerable shortening of the vagina will be overcome in a very short time by regular use.

Another objection, nearly contradictory to the first, is that the vagina, being no longer supported by the cervix, may descend and prolapse. The vaginal wall is supported and fixed by the paravaginal tissue and by the endopelvic fascia between the rectum and vagina and the vagina and bladder, commonly known as the rectovaginal and vesicovaginal septa. The cervix has no function in preserving the topography of the vagina. In fact, large cystoceles occur in spite of the normal position of the cervix and sometimes remarkable descensus of the uterus without any dislocation of the essential lower part of the vagina.

These objections, which have arisen again and again, can be neglected, as they are not properly founded.

Of greater importance seems to be the higher mortality after panhysterectomy, compared with the operative results in subtotal hysterectomy.

TABLE II. OPERATIVE MORTALITY

AUTHOR		TOTAL HYSTERECTOMY PER CENT	SUPRAVAGINAL HYSTERECTOMY PER CENT
Weibel	Total	3.55	4.25
	Complicated	4.5	5.6
	Uncomplicated	2.2	3.4
Amreich		3.8	1.7
V. Ott	768 Cases	7.2	
	Last 375 Cases	0	
Shaw		5.9	3.05
Fullerton and Faulkner		4.1	4.4
		1.3	1.8
Masson		1.8	1.2
Mayo			

There are two fundamental, misleading errors in these statistical reports. In the first place, most of the statistics cover a long period of time, extending over fifteen or more years, as for instance the material of Weibel, which includes the cases of Chrobak, von Rosthorn, and Wertheim, who successively administered the II. Frauenklinik in Vienna. A calculation of this kind leads to mistakes because the final death rate is burdened by the higher mortality of the early cases done during a

period of an undeveloped operative technic. Von Ott, who had a mortality rate of 7.2 per cent in 768 cases, reports that he has not lost a single patient among the last 375 operations. The other mistake which makes the difference in mortality in the two operations entirely worthless as an argument in favor of or against either one, is the fact that the group of cases treated by total hysterectomy includes all of the difficult and complicated cases with a higher operative risk. It is very probable that the mortality would have been much higher if these patients had been subjected to the easier and less dangerous supravaginal amputation. In spite of all this, the difference in the mortality rate, especially in Mayo's statistics, which include 3085 subtotal and 1588 total abdominal hysterectomies from 1916 to 1929, shows such a slight variation that it is by no means justifiable to use this difference as an argument against total hysterectomy. Moreover, I have not lost a single patient in a series of something over 200 cases of abdominal total hysterectomy. I feel that the good results I have had personally are mainly due to the minutely developed technic of my teacher, Prof. Wertheim, which we used routinely at the Second Frauenklinik in Vienna.

The main points of the procedure are as follows: Incision of the vesicovaginal fold and sharp dissection of the bladder down to the level of the anterior fornix of the vagina. This maneuver retracts the vesical and paracervical portions of the ureters out of the danger zone so that the operator can insert clamps safely along the sides of the uterus down to the vaginal vault. The uterus, now perfectly mobilized and held merely by the vagina, is pulled up and the extended fornix of the vagina is opened with the scissors. The vaginal margin is elevated by a volsella and a sponge is introduced into the vagina to avoid the spread of infectious material. Then the vaginal portion of the cervix is everted by means of a tenaculum forceps inserted on the anterior lip. This gives an excellent, clear exposure of the cervical insertion so that further dissection can easily be made exactly along the insertion of the cervix on the vagina. After the removal of the uterus the vagina is fixed by four stay sutures and, if necessary, more hemostatic sutures are placed on the vaginal margin. While the vagina is kept tightly pulled up against the symphysis by one assistant, the clamps on the broad ligaments are replaced by sutures. Then a strip of gauze is introduced into the vagina to provide drainage. The vaginal sutures are cut and, beginning from the infundibulopelvic ligament or from the stump of the adnexa, all the raw surfaces are buried by interrupted sutures. The vagina stays open and acts as a natural drainage canal for all the extraperitonealized ligature stumps.

CONCLUSION

The difference in mortality in operated cases, between subtotal and total hysterectomy, is not noteworthy and is due merely to the selection of more grave conditions for the latter operation.

Every patient with an amputated uterus is threatened during her lifetime by cancer of the cervix. If we believe in the value of active prophylaxis in the struggle against cancer and in our duty to do the best for our patients, we should perform total hysterectomy routinely, reserving the subtotal operation for a few selected cases.

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(For discussion, see page 290.)

THE ROLE OF FOCAL INFECTIONS IN THE ETIOLOGY OF TOXEMIA OF PREGNANCY

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THE conception of pregnancy toxemia as an infectious condition is by no means a new one. In 1884, before the *Congres de Blois*, Delore, of Lyons, set forth a theory "though without being able to present absolute proof," that eclampsia is essentially microbic in origin. He argued that eclampsia produced prodromal symptoms analogous to those of infectious diseases which were known to be due to alterations in the blood content occasioned by the presence of microorganisms: That the extremely high temperature regularly seen in eclampsia (29° up to 42° C.) was likewise characteristic of infectious diseases; that eclampsia had repeatedly been observed to occur in apparently epidemic form, large numbers of cases appearing simultaneously in a single locality or in the practice of a single physician, or clientele of a maternity hospital, having many of the characteristics of tetanus which was now, that is in 1884, coming to be regarded as due to a specific microbe; that many microbic diseases are initiated by convulsive seizures; that the high mortality of eclampsia was similar to that of other infectious maladies, e.g., puerperal and typhoid fevers. Delore had worked diligently in the laboratory in an endeavor to make demonstration of the truth of his theory, but the blood of eclamptics had failed to show anything at all characteristic.

From time to time later workers took up Delore's problem, but with no more positive results. In 1911, twenty-seven years after the meeting at Blois, Billings enunciated his theory of focal infection, and we shortly came to realize that we must abandon the old classifications of aches and pains into sciatica, rheumatism, arthritis, etc., and refer them all to the basic cause, upon the elimination of which their cure depended.

Though Billings' pronouncement at once commanded an attentive hearing, it was not for some years that his findings were applied to the toxemias of pregnancy. Today, after the lapse of almost half a century, we are but little further on than was Delore. We have never been able to find a specific germ responsible for eclampsia, and the belief entertained by some of us that we can trace the toxins circulating in the blood of the eclamptic to some definite focus of infection in her body, outside the special structures requisite for gestation, still lacks positive proof. But views similar to those entertained by Delore had been voiced even before Billings and Rosenow had begun their work. In Russia, before the end of the Nineteenth Century, Stroganoff offered many of the same arguments which the Frenchman had used, claiming in addition that one attack of eclampsia always conferred immunity. As this contention was not true to the experience of a vast number of obstetricians, it tended to throw doubt upon the soundness of all Stroganoff's views, so his theory did not command the attention its merits actually warranted. It has remained for workers in the last decade, Young in Scotland, La Vake and Talbot in this country, should be especially mentioned, to give particular attention to this aspect of the vexatious pregnancy toxemia problem.

Impetus has been given to this study by the efforts lately made to secure better care of pregnant women and to improve the condition of infants by taking active steps in their behalf *before* they present themselves to our attention. We are thus engaged in demonstrating the fanciful assertion made more than half a century ago, I think it was Oliver Wendell Holmes, that a man's education should begin three hundred years before he was born. As every obstetrician knows, Holmes did more to stop the terrible sacrifices of women upon the altar of maternity than any single individual since, and it is not surprising that he entertained ideas in advance of his time on certain other aspects of the branch of medical science with which he chiefly concerned himself. He may have been thinking of three hundred days when he said three hundred years. Certainly, our efforts to promote the welfare of the pregnant woman and the unborn child, and our study of the causes which operate against their welfare, ought to begin at the earliest possible moment.

The foundation of prenatal care is the thorough and complete physical examination. One of the chief features of such examination is the discovery and elimination of focal infections. On this point all schools of thought in regard to the production of the so-called toxemias of pregnancy are absolutely in accord. Even those who deny the possibility of infection being responsible for any of the complications arising during the gestation period, are none the less convinced of the importance of cleaning up abscessed teeth, diseased tonsils and inflamed sinuses. An authoritative monograph recently published states that "At present, no one seriously believes that there is any basis for regarding eclampsia as

due to any specific bacterium," but it continues to sum up the views of some of the leading exponents of the theory that focal infection is responsible for much of the pregnancy toxemia.

And from widely differing sources the evidence in favor of an infectious origin of many of these disturbances continues to pile up. Fowler, studying the records of 600 private cases, found focal infections in 42 2/3 per cent. Among the women who presented these foci of infection were found 75 per cent of the instances of excessive vomiting, all the cases of late toxemia, with 80 per cent of the threatened, and 71 per cent of the actual, premature terminations of pregnancy. Before that F. S. Kellogg observed in the obstetric service of the Boston Lying-in Hospital that 12 per cent of parturient women who had manifested toxemia during pregnancy had a febrile temperature after delivery, and no less than 25 per cent of the eclamptics ran an elevated temperature after delivery. This was following various methods of delivery, so that it could not be traced to puerperal infection. This would certainly point toward a systemic infection existing before labor began.

That the excessive vomiting occasionally seen early in pregnancy may be due to toxemia, is an idea entertained by obstetricians for a long time. Martin, as far back as 1921, gathered data on this phase of a much-vexed question. He cited the explanation of the source of such toxins given by Dirmoser, as being the most rational which had come to his attention. This author considered that the excessive vomiting is a reflex irritation of the sympathetic nervous system, commencing in the internal sexual organs, and through the secretory and motor fibers of the sympathetic leading to the production of changes in the biochemical processes, of the digestive tract especially. These are followed by atony of the intestines, and an increase in the production and absorption of toxins within its lumen. In the urine of pregnant women suffering from excessive vomiting, he found an increase in uric acid, aromatic sulphate, indoxyl, phenols, and other toxic substances, and when rabbits were injected with the derivatives from these patient's excretions, the animals promptly died, while those injected with excretions from normal women, whether pregnant or not, did not have a fatal effect. Severe constipation has regularly been found in the victims of this particular pregnancy complication, and in Martin's own cases he found bad teeth as well as intestinal stasis in every woman who showed excessive vomiting. While this evidence is hardly more than suggestive, it is interesting as having been brought forward before the theory of dental foci of infection had made any appreciable headway, even in this country where it originated. It is hardly probable that Martin in Edinburgh had given much attention to the theories put forth by Billings of Chicago only a short time before. Yet much of the recent work on focal infection has demonstrated how often the lower part of the digestive tract is implicated, either as an original focus, or, more commonly, secondarily infected from

focus located in the upper part of the body. Viewed in the light of this more recent knowledge the connection is not nearly so "far-fetched" as it may have seemed at the time Martin wrote.

Within a year or more, another Edinburgh physician, James Young, made an extremely important contribution to the subject. In a paper published recently, Young sums up his earlier work by saying, "The original investigations professed to show that the eclamptic and the pre-eclamptic toxemias were dependent on a placental necrosis, and they culminated in the experimental reproduction in animals of a disease closely simulating the classical picture of eclampsia." Later he took up the clinical side of the investigation, and decided that the toxic states we are accustomed to call eclamptic or preeclamptic are the result of the circulation in the maternal blood of some specific substance which produces definite effects which he postulates as follows:

(1) Degenerative changes in the kidneys, and albuminuria; (2) characteristic necrotic lesions in the liver; and (3) convulsions. This pathologic syndrome is not seen outside of pregnancy, so it is reasonable to assume that it is in some way dependent upon the presence of the child in utero; either generated by the body of the fetus itself, or the placenta or other tissues connected with gestation. As identical manifestations have been witnessed when there was no fetus, but a hydatiform mole; it would suggest that the placenta is the toxic agent.

Clinically, it has been observed that the placenta expelled after long-continued pregnancy albuminuria often shows multiple infarcts and areas of necrosis. But in opposition to this is another observation frequently made; that is, a perfectly normal placenta obtained in cases of fulminating eclampsia. Young states that what first attracted his attention to the possibility of placental infarction's connection with pregnancy toxemia was the discovery that, although obvious placental disease might be absent in the placenta of a fulminating eclamptic, in other, less violent types of pregnancy toxemia, where days or weeks might elapse between the seizures and the expulsion of the placenta, massive necrosis was always visible without the aid of the microscope. In the large obstetric service of the Royal Maternity Hospital at Edinburgh, he had never seen an exception to this rule. This showed that a degenerative change is always present in the placenta, and that the passage of considerable time is required before it can evolve into the form of infarction readily visible to the naked eye. Young's observations would seem to indicate that if the necrotic areas are the focus, whence is derived the eclamptic toxin, this poisonous substance must be generated during the early autolysis of the degeneration process, while the placenta shows few or no evidences of necrotic change. "By the time the process has progressed to the stage of ordinary naked-eye infarction, the damage has been done."

The major symptoms of eclampsia he believes due to the flooding of the maternal circulation with degeneration products from structures

such as the liver, which had been injured by the placental poisons. Localized degeneration of the placenta must be due, according to his reasoning, to blocking of its blood vessels, though examination of an infarcted placenta will not give microscopic proof as to whether the necrosis followed or preceded the thrombosis. To point out the existence of thrombosis is far easier than to account for it. In placenta previa detachment of the placenta from the uterine wall may cause a degeneration which ends in toxemia. Is it possible that a similar mechanical influence may be at work to cause thrombosis of the maternal vessels in cases of toxemia without placenta previa? In certain of this author's cases there occurred retroplacental bleeding associated with a hemorrhage of the uterine wall, the tube and the broad ligament, which could only be explained as due to a strangulation of the ovarian vein. It is known that in primiparae especially, there are evidences of increased intraabdominal tension. The familiar phenomenon of swelling of the feet and legs is practical evidence of this. Is it possible, the author asks, that similar agencies may cause venous stasis?

After the lapse of seven years Young undertook to answer some of the questions he had raised in his earlier communication. "There is now," he tells us, "much evidence for the view that the eclamptic and the recurring toxemias have a similar origin in the diseased placenta, and that in both types the kidney lesion is secondary, and is often aggravated by the placental damage which occurs in successive pregnancies." Again he says, "Toxemia occurs only when, after placental damage, the abortion or premature birth does not occur soon enough or quickly enough and a large mass of dead or degenerating tissue is left within the uterus in immediate relation to the maternal blood stream, one can conceive that the factors which cause placental damage may be local or general. In the present state of our knowledge we can only speculate, but infection must necessarily thrust itself to the forefront in our search for such acquired causes."

The paper from which the foregoing quotation was made was presented in April, 1927. Thinking its author might have modified his views in the intervening four years I wrote to him, but in his courteous reply he refers me to these very passages as illustrative of his present views.

It was in 1916 that La Vake of Minneapolis discussed Young's work and applied the Edinburgh man's deductions to his own clinical experience. This led him to the conclusion that the thromboses were, in the majority of cases certainly, due to infection. He undertook to go deeper and prove the fundamental action of the infection. Studying the cases of eclampsia and other pregnancy complications coming under his observations, he noted that in all the histories there was mention of infection or foci which were demonstrable on examination. It was notable that most of the women were running a temperature when first seen, so that manipulation after reaching the hospital could not account for it.

Likewise there were many multiparae who had previously had normal pregnancies, but in whom foci of infection could be demonstrated which were proved to have been absent during the previous pregnancies. In a personal communication Dr. La Vake recently asserted that it is his belief that infection acts by inducing changes in the placenta. These changes are grossly signalized by infarction, and it is autolysis of these infarctions which generates the toxins (in accordance with Young's views), or the alterations in the placenta permit the absorption of toxic products from the fetus, which in turn, produces the characteristic lesions.

It has been argued that we have no proof that the infarcts seen in the placenta are due to infection, that they may be just an evidence of an aging organ, or of abnormal alteration in a rapidly growing one. La Vake answers this objection by citing his experience in the great influenza epidemic of 1918. Nearly every placenta seen in the miscarriages or premature labors for which this fearful plague was responsible, was filled with infarcts. A similar phenomenon is seen during every epidemic infection. The placenta is regularly infarcted in cases of pre-eclamptic toxemia, and the exceptional cases which do not show infarction, will have areas showing changes in color strongly suggestive of pathologic alteration, though he is not prepared to state positively that such areas indicate beginning infarction.

Perhaps the most ardent advocate of the infectious theory of pregnancy toxemia is John E. Talbot of Worcester, Massachusetts. For more than a decade he has given the subject intensive study, and though he recently told me that he has found his thesis almost impossible to prove, he is yet convinced that there is an etiologic relationship between chronic infection and the toxemias of pregnancy. His deductions from experiment and clinical observation he has himself summed up as follows:

1. The white placental infarct is the end-result of a hemorrhagic lesion, its evolution being described as a coagulation necrosis.
2. The lesion is a discrete process, often multiple and often repeated in the same placenta.
3. The placental lesion is secondary to a hemorrhagic lesion in the maternal blood vessels of the placental site.
4. There is clinical and histologic evidence that the primary lesion in the maternal blood vessels of the placental site is infectious in origin.
5. The clinical sequence of events observed shows that the lesion is the result of hematogenous infection and that the source of the infection is generally to be found in the teeth and tonsils.
6. By the determination of the infectious origin of placental infarcts, a large clinical entity is demonstrated in pregnancy which has chronic sepsis as its initial lesions.

It is apparent that this conception embraces those of both Young and La Vake, but is far wider in its scope than that of either of these investigators. Talbot does not refer the *primary* cause of pregnancy toxemia to

any one of the products of conception. He postulates a primary focus quite outside the region of the body which chances to be affected, thus placing pregnancy toxemia in the same class with infectious arthritis, which is positively known to be referable to a distant infective focus. Thus he is able to harmonize most of the heretofore prevailing theories as to the origin of eclampsia and allied states. The renal disturbances, which are not often incriminated, can be explained by the secondary effect which a chronic septic process is known to have upon the kidneys. Such a process is capable of causing an inflammatory reaction which can partially or completely inhibit renal excretion, and thereby acts disastrously upon the entire system of elimination. Since the pregnant woman has a double burden of elimination, any such sequence in her body is more disastrous than in the normal and nonpregnant. Talbot believes that the manifestations of pregnancy toxemia are due to the retention of the normal physiologic waste products of gestation. These products are retained because the kidneys are so damaged that they cannot carry on their proper work. Their damaged condition is the result of an infective process the effects of which have been conveyed to them in the blood stream. The reaction of the circulatory system to this wholesale dumping of uneliminated waste is a rise in blood pressure. High blood pressure is accepted as one of the earliest evidences of pregnancy toxemia. Many instances are on record where arterial hypertension has been relieved by the clearing up of toxic foci in teeth, tonsils and elsewhere, and there is also considerable data at hand to demonstrate that disturbances in renal function, notably albuminuria, have also yielded to similar prophylactic measures.

The array of evidence tending to show that pregnancy toxemia is dependent in many instances upon infection derived from a focus outside the products of conception has now reached impressive proportions, even if it cannot as yet be regarded as fully convincing. The most important advance which this conception has made is its correlation of other theories, so that the phenomena upon which they rely are fully explained and brought into harmony with the infectious conception, instead of being discarded and disproved, at least to the satisfaction of the holder of the newer theory, as is usually the case when a new answer to a controversial question is brought forward. We must learn to look upon pregnancy toxemia as a disease that, although peculiar to the gestation period, manifests symptoms which show it to be the same nature as other affections which are seen in the nonpregnant or possibly in the other sex. Chronic nephritis is seen in men and women alike, and its origin has been positively traced to an outside focus of infection. There seems to be good reason to believe that the kidneys may become infected secondarily, either from some original source such as abscessed teeth, nasal sinusitis or diseased tonsils, or the placental site may develop infection from such a focus, this in turn reacting upon the renal system.

Since I have been examining placentae with this idea of infectious emboli in mind it has become increasingly evident to me that the bacteria emptied into the blood stream from infective foci are much more prevalent than previous clinical experience had led me to believe. One experiences a feeling of surprise that the majority of pregnant women escape toxemia during the gestation period; the conditions favoring it are so universal it seems impossible for any to escape. The prevalence of infective foci such as are found in the gums, the tonsils and the nasal accessory sinuses, is by no means confined to the patients who frequent free clinics. With the increasing care in examining pregnant women of all classes these infections are continually uncovered in every grade of society. Precisely the same observations are made by those who conduct periodic health examinations of both men and women. Yet many individuals seem to be able to carry these heavy loads with immunity, and to appear in excellent health despite this serious handicap.

Granted that an individual possesses great natural resistance to the poisons he is constantly generating and distributing through his circulation, he can only remain in apparent good health as long as his metabolic balance is maintained. Placed under some extra strain, this balance is overturned, and the organism will be unable to readjust itself. Pregnancy places just such an extra load upon the woman's organism, and the placenta and the other gestation products offer an ideal site for the development of secondary infection. If the kidneys have been weakened as by pyelitis or the exanthemas in early childhood, they will be the first part of the excretory system to fail. And other lesions found at autopsy upon subjects who died of eclampsia, or symptoms manifested by those who recover which point to involvement of other organs, may be accounted for in the same way. A visualization of eclampsia as a systemic infection brings into harmony many factors which have heretofore been impossible to synchronize in relation to any single etiologic conception.

The convulsions and other manifestations of the eclamptic state may be accounted for by the action of the circulating bacterial toxins upon the sympathetic nervous system. Talbot stresses the effect which increased tone in this system has upon the smooth muscle, and its reflection in the intestinal stasis and increased arterial tension are often the first signs that complications are arising in what has previously appeared to be a perfectly normal pregnancy. The retention of waste products which is the immediate cause of the characteristic manifestations of pregnancy toxemia, is in a measure related to this hypersensitive state of the sympathetic nervous system, which is nature's effort to correct the disturbed metabolic balance. The differences observed in various subjects who may appear to be suffering from precisely the same causes, depend no doubt upon the individual's resistance to the invasion of her blood stream by the infective agents. Once the general conception of

eclampsia as an infectious disease has been grasped, the various features of individual cases fall naturally into order in their proper relations one to another. It may not yet be possible to explain every feature of every case, but I am none the less convinced that in the theory of focal infection as a factor in pregnancy toxemia, we have a more rational basis upon which to work out an effective therapy than any which has heretofore been brought to our attention.

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899 MADISON AVENUE

(For discussion, see page 293.)

THE TREATMENT OF PUS TUBES

BY J. F. BALDWIN, M.D., COLUMBUS, OHIO

THE discussion, in regard to operating on cases of acute salpingitis, which took place at the Sixth British Congress of Obstetrics and Gynecology (*Journal of Obstetrics and Gynecology of the British Empire*, April, 1927), was very interesting and illuminating, but showed very conclusively that few, if any of those who took part in the discussion, ever practiced careful individualization of their cases. Their position was similar to that which has long prevailed with many members of the profession as to nonintervention in cases of puerperal infection, these members grouping all their puerperal patients together instead of individualizing them, so that annually many have been allowed to die who could have been saved by proper and timely operation.

Among the first to advise against any operative procedures in cases of acute salpingitis was Dr. F. F. Simpson. His argument was well presented, and his advice very widely followed, even to the very letter; but active reaction against such a course was presented at the above meeting of the Congress, and at the present time there is quite a pronounced feeling among many gynecologists that that extreme view should be modified and a more rational middle-ground taken by the profession.

If all these cases were due to the same organism, and all patients had the same powers of resistance, a uniform rule might readily be adopted; but the infection is notoriously of varying virulence, and with vast differences in the powers of resistance possessed by the patients. For these reasons, therefore, as I have been urging for years in the matter of puerperal infection, each case of salpingitis should be individualized. There is not the same urgency usually as in cases of acute appendicitis, but some cases are decidedly fulminant and hence each patient should be carefully watched from day to day, with careful attention to pulse and temperature, with repeated blood counts and the most painstaking oversight by the physician in charge.

If the patient is doing well she should be treated expectantly, but otherwise an operation should be done, the extent of which must be determined in each case when the abdomen is opened. If, owing to the virulence of the infection or the lack of resistance of the patient, the disease is rapidly progressing, there should be no delay in operation, and with the abdomen open, the surgeon must use his own judgment as to the extent of the operation required. It is delay that gives us the death record in these cases and the unnecessary end result of pus tubes with all their complications.

Surgical intervention, other things being equal, is always advisable in cases in which there is reason to believe that the function of the tubes is lost and that their further retention will be a source of more or less discomfort with ample possibilities of serious results, particularly in the way of ovarian involvement. The removal of the tubes, and in the great majority of cases the uterus, with saving of the ovaries if healthy and the patient under forty, is practically the safest treatment of these patients and as a rule is attended with the most satisfactory results as to the future happiness and well-being of the patient.

It is doubtless true that the great majority, perhaps 90 per cent, of cases of a simple gonococcus infection will with proper attention make a symptomatic recovery, except probably for sterility, for we must not forget the contention of Noeggerath, yet repeated recurrences must be expected with their dire ultimate results. For the purposes of this paper, therefore, under the term of pus-tubes are included hydrosalpinx and all the other forms of chronic salpingitis, with accompanying sterility, adhesions, retroversion, leucorrhea, dysmenorrhea, backache, and above all pronounced, and frequently prohibitive, dyspareunia. Acute salpingitis will not be considered.

I have operated literally upon thousands of these patients, and there is no operation that I do, the end results of which I anticipate with as great soul-satisfaction as those made for the restoration of these poor sufferers to good health and happiness, including their restoration to conjugal normalcy.

In all patients in whom the ovaries can be saved, it is advisable if possible to save the tubes also, because of the better blood supply which

is thus retained. They should be attached, after carefully covering all raw surfaces, high up on each side so as to obviate the dyspareunia which is so liable to occur if they are merely dropped into the culdesae.

In removing the tubes all experienced operators will agree that the tube should be excised by an elliptical incision so as to remove that portion of it that is in the wall of the uterus; since otherwise a chronic condition may persist at that point.

In the neglected patients, in whom tuboovarian abscesses have developed with extensive destruction of ovaries and tubes, a complete hysterectomy should be made, including the cervix. The uterus itself in these patients is almost invariably more or less infected, is a distinct menace to health and even life, is utterly without value, and its removal, therefore, clearly advisable; even in patients in whom menstruation could be maintained because of the saving of the ovaries, I have not yet found a patient who expressed the slightest regret over the loss of the menstrual function when assured of the preservation of the ovaries.

In these conditions the peritoneum of the true pelvis is extensively involved, and frequently indeed destroyed, leaving on removal of the diseased organs an oozing raw surface. In such cases the technique which I have used in large numbers of cases and have found exceedingly satisfactory, but which I find is apparently used by few others, is to attach the round and broad ligaments into the vault of the vagina at each side so as to provide ample support for the vagina, split the posterior vaginal wall down, or nearly down, to the bottom of the culdesac, pass into the vagina the ends of two or three strips of washed iodoform gauze, and then lightly pack the rest of the strips into the culdesae until the pelvis is comfortably filled, but not too tightly. The sigmoid is then swung around so as to cover this gauze fluff and is then attached by a continuous catgut suture to the healthy peritoneum at the brim of the pelvis. Care should be taken that there is no sharp angulation of the sigmoid at any point, but that it is left with smooth curves. Occasionally it is too short, and under those circumstances the cecum can be swung over so as to close that side of the pelvis. In this way there is no raw surface at any point, and the abdominal cavity is completely shut off from the more or less raw or infected pelvis. Any oozing that follows escapes directly into the vagina, and the gauze can be readily and safely withdrawn at the end of a week.

The gauze strips are each a yard long with selvage ends, and twelve inches wide: each strip is folded lengthwise, with both edges turned in so that there will be no ravelings, and then is refolded so as to be three inches wide and of four thicknesses. Before insertion the gauze rolls are dipped in hot water and wrung out firmly so that any excess of iodoform is removed and the gauze is left moist so as to be "greedy" for absorption. After closing the abdomen a vaginal examination is

made to see that the ends of these strips are within easy reach, and then the fluff is left undisturbed for one week, when all of it is withdrawn with later sterile douches as they may be needed for cleanliness and comfort.

At the end of the week the sigmoid has become sufficiently adherent to the pelvic brim and as further healing takes place it gradually sinks down into the pelvis but without any such angulation as will interfere with defecation. No suprapubic drainage is necessary, but all is provided for through the vagina. In a few cases it will be wise to attach a little extra piece of gauze to one of the strips, this extra piece to be passed a little higher up, usually along the cecum, if an infected area has been found in that region. The appendix should, of course, be removed as a routine, since it is almost invariably involved in the inflammatory process.

In attaching the sigmoid to the border of the pelvis, I always commence at the left side. If an ovary has been saved, it is brought up between stitches above the sigmoid, so that it will not be buried in adhesions. A continuous chromic catgut suture is used, the stitches catching the appendices epiploica, the mesosigmoid or occasionally, if necessary, some of the fibers of one of the longitudinal bands, in this way avoiding any possibility of penetrating the sigmoid. After completing the line of suture, the omentum is brought down carefully so as to still further protect, and the incision closed.

What surgeon it was who first suggested this use of the sigmoid I do not know, but I would like to give him full credit for having suggested a technic of the greatest value but which seems to have been very generally ignored.

One most important point in making an abdominal panhysterectomy,* but one which from personal observation I know is very frequently more or less ignored, is the preliminary thorough sterilization of the vagina and endometrium. The surgeon should attend to this himself, not trusting it to a nurse or intern or perhaps even to his first assistant. The vagina should be thoroughly scrubbed out with tincture of green soap and hot water. The anterior lip of the cervix then steadied with a volsellum, and full strength tincture of iodine injected into the uterus with a pipette. The withdrawal of the pipette is followed by the escape of any surplus iodine. The vagina should then be thoroughly flushed out with dilute tincture of iodine, the excess of this being wiped out with gauze after removing the volsellum. By the use of this method in several thousand hysterectomies I have never had any peritonitis develop from ascending infection from the vagina.

115 SOUTH GRANT AVENUE

(For discussion, see page 284.)

*For the author's technic of abdominal panhysterectomy, with removal of cervix, see *Proceedings of this Association for 1916*, or the *J. Obst. & Dis. Child.* 75: No. 2, 1917.

THE LATE SEQUELAE OF ECLAMPSIA

BY M. P. RUCKER, M.D., RICHMOND, VA.

IN JANUARY, 1931, I presented before the Richmond Academy of Medicine a study of 204 cases of eclampsia. These cases were divided into three groups according to the method of treatment employed. Group I, 38 cases with 12 deaths, occurred in the period when our own chief idea in treatment consisted of immediate delivery either by accouchement forcé or cesarean section. Group II, 58 cases with 15 deaths, came at a more conservative period when reliance was placed upon morphine, chloral and bromides with repeated stomach washings and colonic irrigations. Group III, 108* cases, with 6 deaths, begins with the advent of magnesium sulphate for the control of convulsions. Little else was done to these patients except to give a massive dose of digitalis and plenty of water by mouth. I also attempted a follow-up study of the 171 survivors, but this was extremely imperfect, because of the lack of time.

The present study is a continuation of this follow-up. The cases were derived from three sources, first, private practice; second, cases that came under my supervision on the out-patient service of the Medical College of Virginia and the wards of the Memorial and St. Philip Hospitals, and third, homes for the care of unmarried mothers.

It was comparatively easy to follow up the first group. Two patients were lost track of. With few exceptions the remainder have either been seen personally or by their referring physicians, and I want to take this opportunity of acknowledging my indebtedness to the latter for their co-operation. The second source group has been much more difficult. The majority were colored, and they have a way of changing their names at the least provocation and even when they keep the same name over a period of years they are apt to spell it differently. The third group was practically impossible from a follow-up standpoint. The patients were known only by their first names and many of them came from other states. When they left the institution they disappeared completely.

The technic of following up the clinic cases was as follows. First, a search was made in the city directory and all possible addresses looked up in person. This yielded a few finds. The visiting nurses found several more for me. The records of the Memorial and St. Philip Hospitals yielded one return case, a patient who had an operation for pelvic inflammation two years after the delivery. A menstruating sinus developed in the wound which was removed at a later operation so that the patient was under observation for some time. The files of the out-patient department of the Medical College of Virginia yielded several

*There have been two cases since January, 1931, with no deaths.

subsequent observations. Two returned to the eye department, but the records show that there were no eye ground changes but merely refractive errors. One woman became syphilitic five years after the eclampsia and was treated in the clinic. Two others returned to the venereal clinic the year after their confinement, one for syphilitic treatment and the other for hypertrophic vulvitis. The latter has been under observation for the past three years. Finally the City Board of Health records were searched for births and deaths and those of the State Board of Health for births, deaths, and marriages. This yielded considerable information as to the number of subsequent deliveries, but could not be expected to tell much about abortions and toxemias. The last birth certificate on file gives fairly accurate information as to the number of live children the patient has had. As Richmond is a pleasant place in which to live and nobody leaves it who does not have to, it is fair to assume that the majority that cannot be found are alive but have had no more babies.

There were forty-two in the private group who were traced. However, two are recent cases and a year has not elapsed since their eclampsia. Three others had their convulsions in 1929. In the remaining 37 cases at least three years have passed. The greatest number of post eclamptic years in the series was twenty-eight. Three patients gave a history of a previous attack of eclampsia. Sixteen have had only one subsequent pregnancy and 2 of these were toxic. One of these cost the patient her life. Five have had 2 subsequent pregnancies and 2 of these were toxic. Four have had 3 subsequent pregnancies with two toxemias. One has had 5 subsequent pregnancies with one case of toxemia. In other words there were 43 subsequent pregnancies with 7 toxemias (16.3 per cent). Seven (16.6 per cent) pregnancies ended in abortions or miscarriages and one patient is still pregnant and is toxic. The 42 pregnancies (deducting the one that is still existing) yielded 28 live births (66.6 per cent). The 42 cases of eclampsia yielded 23 live births. Eighteen of the 42 patients had 32 pregnancies before an attack of eclampsia. Nine of these ended in abortions and miscarriages. There were one stillbirth and 23 live births, 68.8 per cent. The total number of pregnancies, preeclamptic, eclamptic and post eclamptic was 119 with 74 live births or 62.2 per cent.

There were 2 deaths in the private group. One woman died at forty-one years of age at her second confinement, eight years after her eclampsia. She was toxic and the death was due to cerebral hemorrhage. The second death occurred four years after the eclampsia. There was no subsequent pregnancy and death was due to tuberculosis. One other patient is in the last stages of consumption but is still alive, four years after her only confinement. Five patients have hypertension but are otherwise well. One of these is fifty-four years of age and in the twenty-seven years since her eclampsia has had one normal pregnancy and labor. The second one is forty-seven years of age and in her twenty-one post-eclamptic years she has had two normal labors, two spontaneous abortions

and one toxic pregnancy with live child. The third hypertension patient is thirty-four years of age and in her five post eclamptic years has had one normal labor, one toxic labor, with a live child, and is now again pregnant. Last year she had pellagra. In the fourth case of hypertension the patient has had one induced labor with a stillborn child in her five post eclamptic years. The fifth hypertension patient has not been pregnant in her three post eclamptic years. It is interesting to note that all 5 patients had antepartum eclampsia.

An analysis of twenty-seven private cases with a history of eclampsia gives a similar picture except for the deaths. Two gave a history of two attacks. There were thirteen (27.1 per cent) post eclamptic toxic pregnancies; two post eclamptic stillbirths and neonatal deaths and seventeen (34.7 per cent) post eclamptic abortions and miscarriages. Five of these were induced. The forty-nine post eclamptic pregnancies produced thirty (61.2 per cent) live babies. The 14 pre eclamptic pregnancies yielded 12 (85.7 per cent) live babies, one stillbirth and one abortion. The total yield of live babies was 57 in 93 pregnancies or 61.3 per cent. A combined total for the two groups was 212 pregnancies with 131 live births or 61.3 per cent. Four patients were found to have high blood pressure and one of these had apoplexy.

An analysis of the clinic cases is less satisfactory because of imperfect data. For instance, the chart of the white cases shows 9 post eclamptic abortions in 25 post eclamptic pregnancies. These were all in one case. The explanation is that this is the only patient that I have been able to follow personally. For the same reason it is futile to try to study the fetal deaths. The figures obtained from the birth certificates on file at the Health Department and those obtained from the clinical histories show an entirely different proportion of live births and neonatal deaths. Among the white clinic patients, one (4.5 per cent) had 2 attacks of eclampsia. There were 3 deaths as follows:

One, at twenty years post eclamptic, of cardiorenal disease. This patient began her childbearing career with an attack of postpartum eclampsia at twenty years of age. She then had 3 normal labors with live babies. At twenty-seven years of age, she began to have a series of 9 abortions. The last 3 were induced on account of pre eclampsia. The last two years of her life she suffered from headaches, and irregular uterine bleeding. She had a blood pressure that was always above 200 and an enlarged heart, enlarged liver, and a subinvolted uterus. The second death occurred at thirty-nine years, five years post eclamptic, from pre eclampsia and apoplexy, one normal pregnancy having intervened. This was the patient's only supervised pregnancy. In her other pregnancies she had only a midwife. The third death occurred at twenty years, three years post eclamptic, from toxemia.

One patient attempted to commit suicide recently. She is thirty-six years old and is pregnant for the ninth time. Since her eclampsia, seven years ago, she has had two normal labors, and one labor induced on account of toxemia.

The 27 colored cases yielded the following results:

One patient had two attacks of eclampsia and one, 4 attacks. There were 5 deaths: One of pulmonary tuberculosis and maniac depressive insanity, eleven years post eclamptic. The second death was due to tuberculosis and occurred the year after the convulsions. The third death was attributed to acute yellow atrophy of the liver. In the eleven post eclamptic years, this patient had four pregnancies and labors normal in every way except for one stillbirth, and one toxic pregnancy with live birth and was four months pregnant at the time of her death. The fourth death was due to chronic nephritis and hypertension, one year after her second attack of eclampsia. The patient was pregnant at the time of her death. The fifth death was also due to nephritis, associated with cardiac hypertrophy. It occurred the next year after her eclampsia.

DISCUSSION

Naturally one's first concern is the likelihood of recurring toxemia. Seven per cent of the private groups had two attacks of eclampsia. Among the twenty-two white clinic cases there was one case of recurring eclampsia and among the 27 colored patients there were 2 cases. One of these had four attacks. In the 4 groups, there was a total of 118 cases that had been followed for at least three years with 9 cases of recurring eclampsia or 7.6 per cent. Peckham found 3 second attacks of eclampsia in 74 post eclamptic women studied at Johns Hopkins and Sym had exactly the same figures in a study in London. At the Chicago Lying-In, Greenhill traced 60 post eclamptics, and in the 18 pregnancies that followed, there was one attack of eclampsia. Bund found that 20 per cent of the Marburg Clinic survivors had eclampsia subsequently. *It is possible that the length of time that these patients were followed may explain the differences in the figures.* In my cases from one to eleven years elapsed between the attacks with an average of four and six-tenths years. The negro woman who had four attacks, had her second attack five years after the first one, her third attack eleven years after the second and her fourth attack two years after the third attack. There were 43 subsequent pregnancies in the private group and seven (16.3 per cent) were toxic. In the group of patients who gave a history of previous eclampsia, there were 13 (27 per cent) post eclamptic toxic pregnancies. In Sym's cases, 40 per cent of the 42 post eclamptic pregnancies showed signs of late toxemias of pregnancy. In the Johns Hopkins' group, 25 have been delivered since and only 11 went through a normal pregnancy and labor.

Five or 13.3 per cent of my private group now have hypertension and 14.8 per cent of the cases with a history of eclampsia. One of the latter has had a slight stroke of apoplexy. The remaining eight are in good health with the exception of the fifty-four year old patient who has frequent headaches. To this picture should be added the four toxic deaths and the three deaths from cardiorenal disease, as well as the case of maniac, depressive insanity in which the patient died of tuberculosis

and possibly, also the threatened suicide. One-half of the 60 cases that Nevermann reports had some of the following symptoms: headache, weakness of memory, visual disturbance, edema, hypertension, cloudy urine or albumin and casts and three had frank severe chronic nephritis. Of Greenhill's 60 cases, 2 patients died within three years of chronic nephritis and 3 had chronic nephritis at the time he prepared his report. Ten per cent of Bund's patients had chronic nephritis.

In reviewing the private groups, one is struck by the number of abortions, miscarriages, neonatal deaths, and stillbirths. A total of 212 pregnancies yielded 61.3 per cent live births. Ninety-seven post-eclamptic pregnancies yielded 64.9 per cent and 40 anteeclamptic pregnancies yielded 70 per cent live births. As a control, I studied the histories of the 155 private patients now under antepartum treatment. This is not quite a fair sampling for many of these patients were referred because of previous dystocia and several came because of repeated abortions. These patients gave a history of 190 pregnancies with 45 (23.7 per cent) abortions and 21 (11 per cent) neonatal deaths and stillbirths. The yield in live babies was 124 or 65.2 per cent. In Sym's cases, 60 postecclamptic labors produced 48 live babies or 80 per cent. It would seem therefore that the immediate risk to the child is greatly enhanced when there is toxemia present. In the labors following uncomplicated pregnancies even if there be a history of eclampsia, the risk to the baby is a normal one. When eclampsia actually occurs, the risk to the baby is much greater. However, the children that survive the puerperium, have according to Bund as good an outlook as any other. He reports one child born of an eclamptic mother who in turn had eclampsia when she was confined. So far as I know, only one child in my series, born during eclampsia, has arrived at motherhood and her pregnancy and labor have been normal.

Among the white patients one died of tuberculosis and one is nearly dead of that disease. Two of the colored patients died of tuberculosis. In order to form some idea as to how many deaths from tuberculosis one should expect in such a group, I divided the 171 patients who survived the eclampsia, whether I was able to trace them or not, first into white and colored. I then grouped them into ages. For instance a fifteen year old patient who had eclampsia 10 years ago was classed as 15, 16, 17, 18, 19, 20, 21, 22, 23, and 24 years. Mr. C. E. Hayward, Registrar of the Richmond Bureau of Health worked out for me the death rates per 100,000 from pulmonary tuberculosis among white females and colored females by age groups for the City of Richmond for the years 1920-24 inclusive. Table I shows this data grouped together.

It is thus seen that the actual number of deaths from tuberculosis among those who could be found, is decidedly greater than what one would expect for the whole group of 171 females. It is realized of course that the group is too small to justify any conclusions on this

point. It is interesting to note in this connection that Acosta-Sison found two cases of active tuberculosis in 38 autopsies on women dying of eclampsia.

TABLE I

WHITE				COLORED		
AGE GROUPS	NUMBER	AV. RATE	EXPECTANCY	NUMBER	AV. RATE	EXPECTANCY
15 to 20	84	4.4	0.00370	120	48.5	0.01455
20 to 25	184	15.6	0.02870	166	71.2	0.11819
25 to 30	207	15.1	0.03126	81	63.0	0.05103
30 to 35	146	10.7	0.01562	47	33.0	0.01551
35 to 40	81	6.4	0.00518	30	25.8	0.00774
40 to 45	52	7.3	0.00380	32	20.6	0.00659
45 to 50	23	7.8	0.00179	7	15.5	0.01109
Over 50	22	9.8	0.00216			
Total	799	77.1	0.09221	483	277.6	0.22470

SUMMARY

In 49 clinic cases, 37 private cases followed for at least three years and 27 private cases who gave a definite history of eclampsia, recurring eclampsia was found in 7.5 per cent.

From 16 per cent to 27 per cent of postecclamptic pregnancies were toxic.

The yield of live births per pregnancy is somewhat less after eclampsia than normal, but this can be satisfactorily accounted for by the number of toxic pregnancies that one finds at this time.

Upwards of 13 per cent of the private patients were found to have hypertension.

There were four deaths from toxemia in postecclamptic pregnancies and three deaths from cardiorenal disease in the 86 cases that were followed for three years or more. The "expectancy" for the whole group is 0.8.

More tuberculosis occurred in this group than one would naturally expect.

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(For discussion, see page 282.)

AN EIGHT MONTHS' EXTRAUTERINE PREGNANCY CALCIFIED AND RETAINED FOR FORTY YEARS*

BY PAUL TITUS, M.D., AND J. R. EISAMAN, M.D., PITTSBURGH, PA.

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THE comparative rarity of such a case as this probably is sufficient warrant for its being reported. In this particular instance, however, certain features of the diagnostic study of the patient present such unusual aspects as also to merit some attention on this account.

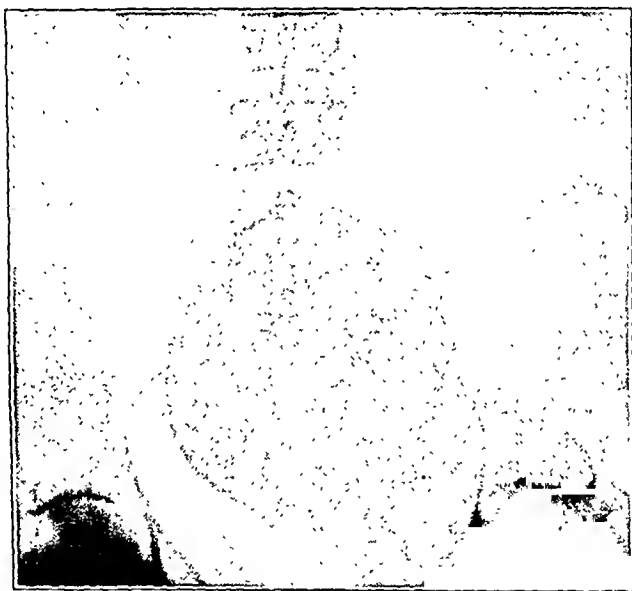


Fig. 1.—Calcified tumor mass containing fetal bones.

History.—The patient, Mrs. M. B. (Hosp. No. 2117), a negress, aged sixty-four. She was admitted to the Gynecological Division of the St. Margaret Memorial Hospital October 24, 1930, with symptoms of partial intestinal obstruction. A tumor mass was palpable in the lower abdomen extending 10 cm. above the symphysis and deep into the pelvic cavity. She stated she had had one normal delivery and that in 1890 she had become pregnant again. At eight months fetal movements ceased, at the same time she thought, because of some painful uterine contractions with vaginal bleeding, that her labor had begun. The bleeding lasted two weeks and then ceased after which time she menstruated regularly until her menopause a number of years later.

The large mass in her abdomen did not disappear and from time to time gave her considerable discomfort from pressure.

*The illustrations in this work were prepared under a grant from the John C. Oliver Memorial Research Foundation at the Hospital.

She related that her doctors told her, however, that this baby would either "putrefy or petrify" and that if it "putrefied she would die while if it petrified she would be all right," so as she put the matter, there was "nothing to be done



Fig. 2.—X-ray after injection of uterus with iodized oil; demonstrating extrauterine and extratubal location of mass.

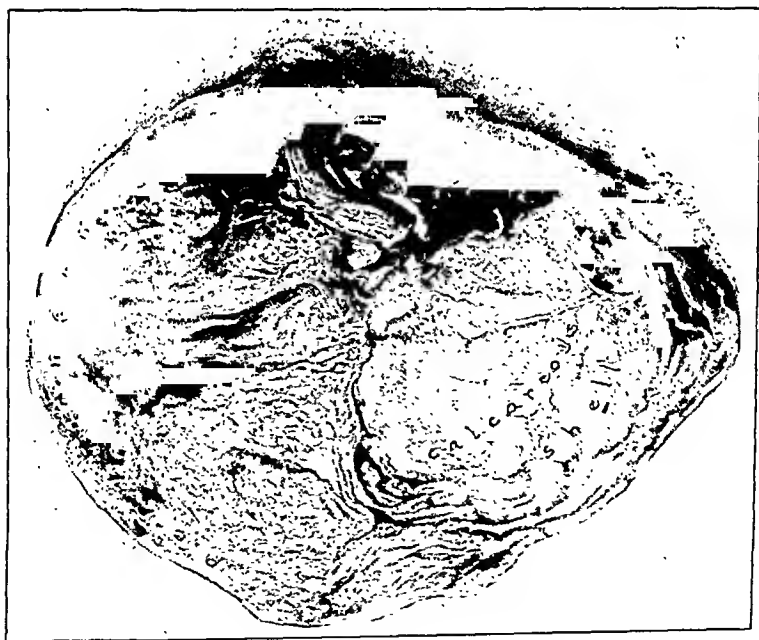


Fig. 3.—The tumor mass after removal.

about it." Her first husband died and presently she married again. The couple grew old together, and she became totally blind from cataracts. At the time of her admission at sixty-four years of age she was greatly overweight, with blood



Fig. 4.—X-ray of excised mass.

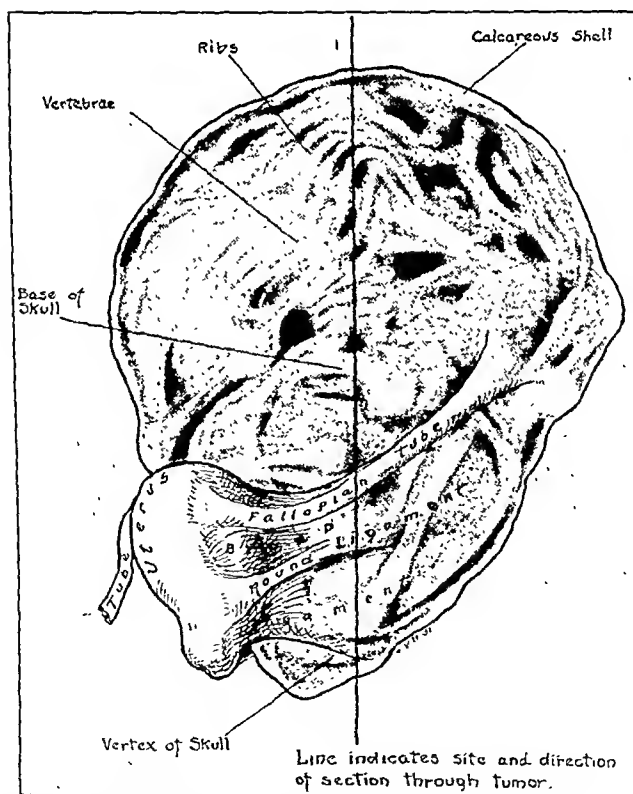


Fig. 5.—Schematic reconstruction of operative findings and relations. (Vertical line shows direction of incision for dissection.)

pressure 190/110, and albumin and pus in her urine, while for some months previous to her admission she had been showing signs of partial intestinal obstruction with increasing pain and discomfort.

Her physician, Dr. J. E. Brown, who referred her to us made a tentative but accurate diagnosis from her history and the palpatory findings, of tumor formation due to pregnancy and failure to deliver.

The logical conclusion was that this was an abdominal or tuboabdominal pregnancy because the gestation had advanced to eight months, and after its interruption by death of the fetus she had menstruated normally. It was of interest to establish this accurately, however, so that a thorough x-ray study was undertaken.

The first picture showed a calcified tumor mass containing fetal bones. (Fig. 1.) The uterine cavity was then injected with iodized oil according to the technic devised by Cary,¹ and this x-ray film (Fig. 2) shows the uterus situated to the right of the mass with the left tube extending along the anterior lower surface of the mass and disappearing into its left side.

This would indicate that we were dealing with a tuboabdominal pregnancy rather than a broad ligament extraperitoneal pregnancy as described by Williams² because the tube was low on the mass rather than high, and seemed to extend into it. Later, on sectioning the tumor no remnant of the placenta could be found so that the point of its attachment is entirely a matter of conjecture.

She was operated upon on October 28, 1930 under intravenous sodium amytol and nitrous oxide-oxygen anesthesia.

The tumor mass was firm and calcareous and densely fixed in the pelvic cavity. Posteriorly and on the left side it was bound down by innumerable adhesions which were freed by manual dissection. Under clamps its pedicle attachment consisting of the left fallopian tube and a portion of the broad ligament was divided. It was then seen that the bed of the tumor was, as previously diagnosed, on the posterior surface of the left broad ligament. This bed which oozed freely was closed with mattress sutures and the severed end of the tube was quickly ligated and buried beneath the left round ligament. Both ovaries showed senile atrophy and no pathologic changes.

Several omental adhesions were ligated and divided. The sigmoid though involved in the adhesions of the tumor bed was not torn, but did ooze freely. This was controlled by application of hot pads.

The tumor mass when removed measured 14 by 11 by 9 cm. and presented a rough stony shell.

The patient was greatly distended with gas and vomited from the outset after operation. Repeated gastric lavage and proctoclysis by the Harris tidal wave method, as well as prolonged venoclysis of dextrose and salt solution gave encouraging results but on the fifth day the ileus was again more marked. During the administration of spinal anesthesia to relieve the ileus she suddenly died.

The autopsy findings, in addition to chronic myocarditis and mitral and aortic endocarditis, arteriosclerosis, cholecystitis with stones, and acute nephritis, were as follows, "the stomach was dilated and the small intestine throughout practically its entire extent was several times its normal diameter; some loops were discolored and the wall was thinned suggestive of a paralytic ileus. A small amount of fibrinous exudate and here and there red adhesions the appendix and cecum were also involved in a beginning peritonitis. The area along the left lower abdomen where the tumor had been removed showed a puckered suture and completely covered raw surface. The surgical closure of the area was perfect."

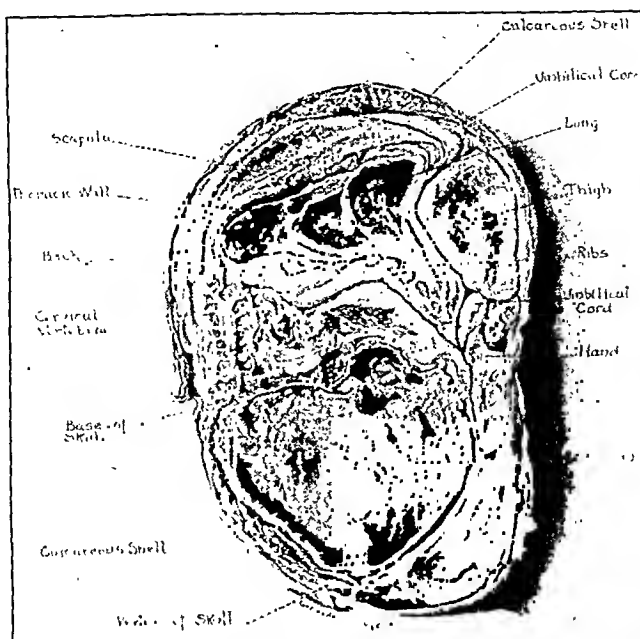


Fig. 6.—Left half-section of incised mass.

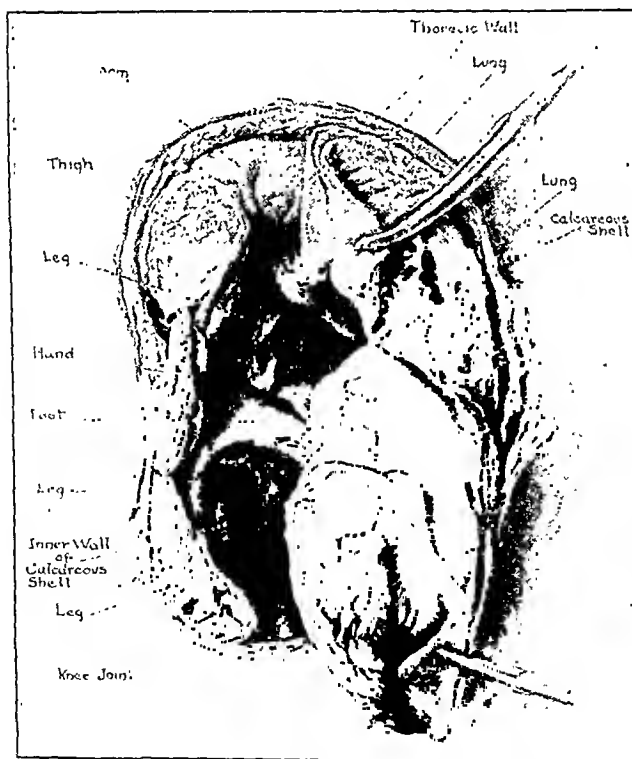


Fig. 7.—Right half-section of mass with partial removal of contents to show relations.

HISTORICAL

Under the subject of lithopedion DeLee³ states in his textbook "Wagner had a case where a mummified fetus was carried for twenty-nine years, and Virchow one for twenty-eight years. Smith describes a calcified fetus which was removed from a woman ninety-four years old sixty years after conception." He also says that "suppuration may occur at any time even after calcification is marked," and that many cases have been reported.

SUMMARY

The outstanding points of this case briefly summarized are (1) that an abdominal pregnancy of approximately eight months' development became calcified and was carried as a tumor for forty years, (2) that an accurate diagnosis of the condition itself was made in advance of operation by x-ray which showed fetal bones within a calcified shell, (3) that by injection of the uterine cavity and the fallopian tubes with iodized oil the location of the fetal mass was determined by x-ray as being outside the uterus and tubes, a diagnosis of extrauterine pregnancy thus being established in advance. Visualization of uterus and tubes by x-ray after injection is a relatively new procedure supplementing Rubin's tubal insufflation test, and we believe from a brief search of the literature that this may be the first time that there has been an opportunity for the same procedure to be used for the diagnosis of abdominal pregnancy.

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1015 HIGHLAND BUILDING

(For discussion, see page 288.)

CARCINOMA OF THE UTERUS COMPLICATED BY TUBAL GESTATION

BY STEPHEN E. TRACY, M.D., F.A.C.S., PHILADELPHIA, PA.

CARCINOMA of the cervix uteri complicated by normal gestation while not a frequent association, has been referred to repeatedly in the literature and is recognized as a most serious complication. On the other hand, carcinoma of the cervix uteri associated with tubal gestation is a rare condition and is not even mentioned. It is a condition even more hazardous than carcinoma of the cervix complicated by a normal gestation.

Batisweiler reported a case of ectopic gestation with cancer of the cervix in a woman thirty-seven years of age, who had had three normal deliveries and one abortion. In the course of a radical Wertheim operation, an ectopic gestation was discovered in the right tube. The histologic study of the tissue confirmed the clinical diagnosis.

Dertchinsky also reported a case of cervical cancer in connection with ectopic gestation. The patient entered the clinic Dec. 30, 1925. She was thirty-two years of age and had had six pregnancies, five of which were normal while one terminated during the eighth month. Her last menstrual period was on Dec. 8, 1925. On vaginal examination the cervix was found dilated, hard and tubercular. The uterus was firm and somewhat enlarged. The appendages, especially the right one, were enlarged, painful, and only slightly movable. Zweifel's modification of Wertheim's operation was performed January, 1926. A small quantity of freshly coagulated blood was found in the abdomen and pelvis, and there was a small hematocele in the right tube. The diagnosis of the lesion was confirmed by the histologic study.

Reeh reported a case of tubal gestation in connection with carcinoma of the cervix in a patient forty-three years of age, who had given normal birth to eleven children, and had an abortion two and one-half years before the present illness. Vaginal examination revealed a carcinoma of the cervix. During the operation there was discovered a right tubal gestation.

Pokrowski reported a case of tubal gestation in connection with a carcinoma of the cervix uteri in a patient twenty-six years of age, who was admitted to the clinic Jan. 14, 1906. She had had one normal delivery. The last menstrual period was two weeks before admission. A panophorosalphingohysterectomy was performed. There was a right tubal gestation.

Kimura reported a case of carcinoma of the cervix uteri with a right tubal gestation in a patient thirty-six years of age, who had had three normal deliveries. The anterior lip of the cervix was hypertrophied and slightly eroded. On the posterior lip a bleeding ulcerated erosion was observed. The right tube was swollen to the size of a hen's egg and adherent to the uterus. The preliminary diagnosis was incipient cancer of the cervix uteri, complicated by a right adnexal tumor. The treatment was a radical hysterectomy. It was Kimura's opinion that the growth of the cancer was much accelerated by the ectopic pregnancy.

Hirschberg reported a case of carcinoma of the cervix uteri with a left tubal gestation. The patient was thirty-two years of age. Menstruation began at the

age of seventeen. The quantity was normal, but the periods were irregular. The last period was fourteen days prior to examination.

There had been two abortions, but no fullterm deliveries. The last abortion was seven years ago. The patient had complained of pain in the left side of the lower abdomen and back for three weeks. A radical Wertheim-Zweifel operation was performed, and a tubal gestation was found on the left side. There was a pavement epithelium carcinoma of the cervix uteri.

Tubal gestation in the presence of carcinoma of the corpus uteri is an even more unusual combination. A rather extensive search of the literature failed to reveal a single report of such a case in the published indices. In this connection the report of a case is of interest.

Mrs. E. B. came under observation Jan. 3, 1929. Menstruation was established at the age of thirteen years. The periods were regular, of eight days' duration, and of the thirty-day type. The patient gave a history of four normal pregnancies, with fullterm spontaneous deliveries. Three and one-half years ago she was operated upon for a left tubal gestation. The last normal pregnancy antedated the ectopic gestation about seven years. The last menstrual period was Nov. 15, 1928.

On December 15, the menstrual flow was scanty, and lasted only two days. It recurred every two or three days, but was a mere spotting. This condition continued until November 30, when the patient suddenly experienced a sharp shooting pain in the lower abdomen which lasted about one-half hour. This was followed by a mild vertigo. The following day she had a similar attack of longer duration.

Examination of the abdomen was negative. Vaginal examination showed a good perineum and a normal cervix. The left ovary was normal. There was considerable tenderness on the right side, but no pathology could be detected. Rectal examination was negative except for tenderness in the right side of the pelvis. The following day a second pelvic examination was made under gas anesthesia, with similar findings. A thorough investigation eliminated the renal system. A diagnostic dilatation and curettement was done, and a rather large amount of suspicious-looking material was removed. The pathologist reported an adenocarcinoma of the corpus uteri, which diagnosis was confirmed independently by another pathologist.

On January 11, 1929, when the peritoneal cavity was opened, there was found considerable free dark blood. The omentum was adherent to the former incision. The right appendage was attached to the side of the sigmoid, and when delivered was found to be slightly enlarged and was suspicious of an ectopic gestation. When the fallopian tube was incised a very small fetus was revealed.

In view of the fact that the pathologist's diagnosis had been confirmed, a panhysterectomy was performed. The patient had a normal convalescence, and was discharged in good condition. Histologic study of the uterus confirmed the diagnosis of adenocarcinoma of the corpus uteri located slightly above the internal os. The tube showed a salpingitis with ectopic gestation.

Ectopic gestation in the presence of carcinoma in any part of the uterus is a rare complication. Only six cases of carcinoma of the cervix uteri associated with tubal gestation could be found after a rather extensive search of the literature. In all of these six cases the malignancy was recognized, but in not a single case was the diagnosis of tubal gestation made prior to operation.

Ectopic gestation in the presence of carcinoma of the corpus uteri seems to be almost incompatible, as no previously reported case could

be found. The malignancy in the case reported was apparently early and developed slightly above the internal os. Had the malignancy been higher in the endometrial cavity the uterine ends of the tube would have been blocked from the overgrowth of the tissue, and it would have been impossible for the spermatozoa to have entered the tube.

In this case, although the history was suggestive of an ectopic gestation, the association of a tubal gestation was not even considered when the malignancy was discovered, as such a combination was unknown.

It does not seem possible that this is the only case of its kind. There have probably been other cases which have been overlooked or not reported. As in the cases of carcinoma of the cervix complicated by tubal gestation, the diagnosis of the tubal pathology was not made until after the celiotomy.

Cases of gestation associated with carcinoma of the cervix uteri have been reported in which the patient improved greatly during gestation, only to suffer a relapse and die a short time later.

There is no doubt that the growth of a carcinoma in any part of the uterus is accelerated by gestation. This being the case radical treatment should be instituted as soon as the malignancy is recognized.

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1930 CHESTNUT STREET

(For discussion, see page 287.)

Brindeau, A.: Spontaneous and Permanent Dilatation of the Cervix During Pregnancy. Bulletin de la Société d'Obstétrique et de Gynécologie, Paris, 1928, No. 4, p. 350.

The author reports three rare cases in which there was true effacement and extensive dilatation of the cervix during pregnancy unaccompanied by painful contractions or uterine overdistention. One patient was carefully examined for her reflexes and sphincter activities but the reflexes were normal and there was no paralysis of the sphincters.

J. P. GREENHILL.

ABDOMINAL INCISIONS

By E. P. SLOAN, M.D., BLOOMINGTON, ILL.

ABDOMINAL incisions of all kinds heal so kindly and from the standpoint of the visible scar are so satisfactory, that it may seem as if the type of incision used is of little importance. If the incision heals promptly and the external appearance of the scar is satisfactory, we are prone to ignore the incision as the cause of late distressing symptoms. Careful consideration of the remote as well as of the immediate results following all muscle-cutting incisions will show that a scar becomes weaker as the years go by and that adhesions form under the scar in the majority of cases. The only support usually found across the old abdominal scar at the second operation is by a few fascia fibers connecting the edges of the anterior rectus sheath. The muscles and the posterior sheath being separated by a considerable interval filled with omentum, a portion of the stomach, transverse colon, small intestines or the sigmoid all adherent to the under surface of the scar. This is, of course, to be expected within one to five years following drainage or infection but the same conditions are usually found ten to fifteen years after clean abdominal incisions that are closed without drainage and that heal by first intention. According to Boeckmann¹, Abel's statistics from German clinics showed 8.9 per cent hernias after longitudinal incisions with healing per primam and 31 per cent after healing per secundam. Abel's statistics, however, covered only a period of five years subsequent to operation. The incidence of hernia would undoubtedly have been shown to be much larger had his statistical period been twenty years.

It seems to be generally accepted that the incidence of hernia following vertical incisions when large drains are used or when infection occurs is large. The high incidence of hernia or at least of a weak scar five, ten, or more years after all muscle-cutting abdominal incisions is not so generally recognized.

Out of 239 cases of postoperative hernia that came under my observation, the hernia followed operation in 93, at which large drains were left in the incision. In 41 of these 93 cases the hernia appeared within two years after operation, in 22 within five years and in the remaining 30 after periods of from five to sixteen years had elapsed. In 103 of the 239 cases a small drain such as a small tube to the gall bladder region had been left at the previous operation. The hernia was discovered within five years subsequent to the operation in only 4 of these cases. The incision had been closed without drainage and had healed by first intention in the other 99 of the 239 cases. The hernia became evident in

9 of these cases in the sixth year, in 19 in the seventh year, in 24 in the eighth year, in 21 in the ninth year, in 14 in the tenth year and in 12 after a period of more than ten years had elapsed since the operation.

During the same period of time 128 patients with no external evidence of hernia were subjected to operation five or more years subsequent to an upper abdominal operation with a vertical incision. A strong satisfactory union across the old incision with union of the posterior sheath of the rectus was found in only 9 of the 128 cases. In the other 119 of them, although no evidence of hernia could be discovered by external examination, it was disclosed at operation that the entire support across the old incision consisted of only a thin layer of fascia fibers connecting the edges of the anterior sheath of the rectus.

The high incidence of postoperative adhesions to the inner side of the scar is of more consequence than the danger of hernia. Adhesions to the under surface of the scar were absent in only five of the 367 cases already mentioned. Some other factor than imperfect closure must be responsible for the high incidence of postoperative adhesions, as many cases are seen with a strong apparently perfect scar but with massive adhesions under it.

The destruction of the trophic nerve supply to the structures between the incision and the median line has been considered by many investigators as a possible factor in the production of these adhesions. Although it is true that after a period of years the fasciae is found to be atrophied between a vertical incision that severs the nerves and the median line, the adhesions are certainly present soon after operation and long before the effect of this disturbance of the trophic nerve supply is operative. It seems to me that the presence of these adhesions is much better explained as due to the irritation of the peritoneum from the tension placed upon the sutures in the posterior sheath near or through the peritoneum. Evidence in support of this theory is furnished by the fact that the incidence of adhesions following clean operations below the semilunar fold of Douglas is a fraction (perhaps 15 per cent) of that following operations above the fold.

The old rule that the danger of hernia with longitudinal incisions increases in proportion to the square of the length of the incision seems to be borne out in our experience. According to this rule if in a given number of operations with 3-inch incisions there would be 9 hernias, with 4-inch incisions there would be 16 and with 5-inch incisions there would be 25. Of the patients that we have seen with 10-year-old scars from upper abdominal incisions over 80 per cent of those with 5-inch scars and 60 per cent of those with 4-inch scars and 27 per cent of those with 3-inch scars have had some appreciable and demonstrable weakening of the abdominal wall at the site of the old incision.

Close and accurate suture of the peritoneum and skillful closure of the muscles and aponeuroses cannot relieve the stitches from tension, espe-

cially when the intraabdominal tension is increased by coughing, vomiting, or straining. The tension thrown directly upon the stitches or sutures holding the ends of the severed transverse aponeurotic fibers together is enormous.

A few years ago we attempted to measure the force required to hold ends of the severed transverse fibers together while the patient was struggling under light anesthesia. By means of spring balances attached to mouse-tooth forceps we were able to accurately measure the force required to hold the edges of an incision together. We found that the longer the vertical incision the more force per inch of incision is required to bring the edges together. The force required increases in proportion to the square of the length of the incision. Thus, with a patient lightly anesthetized and coughing or struggling, about ten pounds of pull on each side is required to hold the edges of a three-inch incision together. If the incision is lengthened to four inches it will require eighteen pounds and if lengthened to five inches it will require about forty-five pounds on each side to hold the edges of the incision together. Therefore, we seem justified in formulating the following rule: *The lateral pull upon the suture line following a vertical abdominal incision and the incidence of postoperative hernia are in proportion to the square of the length of the incision.*

By the same procedure, with a Sprengel transverse incision in which the rectus muscles were cut transversely, we measured the slight amount of force required to hold the edges of the incision together, but the relative vertical and transverse abdominal tension on different patients did not furnish dependable data for an accurate comparison. To be of value the vertical and transverse tension must be measured under the same conditions and on the same patient. This was done by measuring the force required to hold together the transverse and vertical portions of an L-shaped incision, one side of which was vertical and one transverse. These measurements, carefully obtained in 20 cases, showed that the lateral tension was in every case fully thirty times as great as the vertical. It seems that the extreme transverse tension may explain the almost complete certainty that weakening of the abdominal wall and hernia will ultimately follow a vertical incision. Recognition of the high incidence of postoperative adhesions and hernia following vertical incisions and the urgent need for their prevention have stimulated much research work on this problem.

Lower Abdominal Incisions.—In 1896 Küstner² proposed the transverse incision in the lower abdomen. In 1900 Pfannenstiel⁵ presented his combined transverse and longitudinal incision that almost entirely eliminates the danger of hernia in pelvic operations. Its advantages were recognized; and it was in routine use by many men in the United States during the period of 1900 to 1909. Following Boeckmann's presentation of the literature extant and the reported results in 1909, it

came into more general use. Since that time, it has been used routinely in our clinic. We are convinced that from the standpoint of the patient's welfare it is far superior to the longitudinal incision. The dangers of postoperative hernia and of separation of the wound margins are eliminated. The convalescence is shortened and postoperative discomfort is markedly lessened. It affords ample room for all operations in the lower abdominal region. The nerve supply of the abdominal wall is not interfered with. It is easily closed and followed by almost no danger of postoperative hernia.

Appendectomy Incisions.—The right rectus incision for appendectomy that is closed without drainage and that heals by first intention is seldom followed by hernia if the incision is a short one and located below the level of the semilunar fold of Douglas. If the incision extends upward and the transverse fascia fibers that terminate in the semilunar fold of Douglas are severed, the incidence of hernia is greatly increased. This is easily explained by the fact that greater tension is placed upon the fibers that constitute the semilunar fold of Douglas than upon any other transverse fibers in the abdomen. In no other location is a longitudinal incision so liable to be followed by adhesions under the scar. The tension placed upon the sutures in the posterior sheath near the peritoneum by coughing, vomiting, or abdominal distention seems to be a logical explanation for this fact.

A muscle-splitting incision similar to the McBurney incision but placed just inside the iliac spine permits direct access to the meso-appendix without displacing loops of the small intestine mesially or rotating the head of the cecum. A muscle-splitting incision in this location affords an opening at least two and one-fourth inches in diameter and immediately over the base of the appendix. The appendix especially when retrocecal can be removed with greater ease through this incision than through a right rectus one. In not more than one-fifth of one per cent of cases is the anatomical situation of the appendix such that any difficulty is encountered in its removal on account of the limitations of this incision.

Upper Abdominal Incisions.—Oblique incisions and many variations of the longitudinal incision were proposed but no incision was suggested that preserved the transverse fibers and the nerve supply until 1910.

In 1910 Sprengel^a published the description of a transverse incision for operations in the upper abdomen that seemed to promise relief from the tragic consequences of the longitudinal one. Many operators in this country adopted it for a time. It has undeniable advantages over the longitudinal one. It affords ample room for access to all organs in the upper abdomen. The nerve supply of the structures in the abdominal wall is not interfered with. It is easily closed and according to some authorities its use is accompanied by almost no danger of postoperative hernia or of postoperative adhesions. In our experience the danger of

postoperative adhesions is lessened if not entirely eliminated but the same cannot be said of hernia. If a rectus muscle is divided at the level of a transverse striae, union will be firm and followed by little or no danger of hernia. The striae however are seldom at the same level on both sides and if a muscle is divided between the striae the section of muscle from the point of the division to striae above and to one below will atrophy with weakening of the scar and hernia. The hernias that in our experience followed the use of this incision occurred in every single case on the side that the muscle was severed between the transverse striae. The almost universal feeling that such large important muscles as the recti muscles should not be severed if their continuity can be preserved perhaps accounts for the fact that this incision has not come into more general use.

In 1915 McArthur⁴ described a combined vertical and transverse incision for gall bladder operations. The usual longitudinal incision is made through the right rectus muscle. The muscle is separated from the posterior sheath and the fibers of the aponeurosis of the transversalis are separated transversely. This incision is ideal in every respect for a cholecystotomy. It does not provide ample room for more extensive procedures.

A new incision for all operations in the upper abdomen was developed in our clinic in 1922. This incision preserves the rectus muscles, all of the fibers of the posterior sheath and does not destroy any of the nerve or blood supply of any of the structures in the abdominal wall. It is easily made and gives ample exposure for all operations in the upper abdominal region and permits an approach to the appendix. An illustrated description of this operation and a report by Dr. G. A. Sloan from our clinic of its use in 114 cases appeared in the November issue, 1927, of *Surgery, Gynecology and Obstetrics*. Since that time it has been used in our clinic 314 times. It is of especial advantage in the presence of sepsis and when the institution of drainage is indicated. In 147 of these 314 cases, 29 of which were "septic cases," drainage was instituted through the transverse incision of the posterior sheath and a stab wound through the rectus muscle, anterior sheath and skin. In 27 cases the drainage was instituted through stab wounds placed above the incision. In 11 cases of perforation from ulcer of the stomach the drainage was brought out at the inner edge of the rectus through this incision. In 15 cases the drainage continued for more than five weeks. More than three years have elapsed since 114 of these patients were operated upon and in the entire series only 3 hernias have developed. In these 3 cases the hernia occurred at the point where a large drain had been left for a considerable period of time. In each case the hernia was as easily closed under local anesthesia as a small umbilical one.

An opportunity to explore the under surface of the scar has been afforded in 9 of these cases. In only 2 out of the 9 cases were any ad-

hesions present and in these 2 cases the adhesions were omental ones and slight in extent.

The postoperative complications that so often follow upper abdominal operations are almost entirely obviated by the use of this incision. The statement by McArthur that "the transversalis is an active respiratory muscle and following a longitudinal incision, with each respiration it so tugs and pulls on the line of sutures as to make it give away" seems to be supported by the fact that the fibers of the transversalis are not severed in making this incision and that postoperative respiratory complications are rare. The pain and discomfort incident to coughing, wrenching or abdominal distention are greatly minimized. The patient can turn in bed or even raise himself to a sitting position without pain from increased tension upon the sutures in the incision. Less narcotics and sedatives are required following operation, more freedom of motion may be permitted, the convalescence is shortened and a better skin scar with less deformity is secured than is possible with a right rectus or transverse incision.

Description of the Incision.—1. An incision through the skin and subcutaneous tissue is made in the linea alba from the ensiform to a point 3 or 4 cm. above the umbilicus. The incision is extended around the umbilicus on each side and continued downward and over the recti muscles to a point slightly below the umbilicus leaving a V-shaped piece of skin and subcutaneous tissue around it. The skin and fat are dissected outward on each side until the aponeuroses over the inner borders of both recti muscles are exposed.

2. The anterior sheaths of the recti are incised vertically about one centimeter lateral to the inner borders of the muscles. The extent of the exposure obtained depends upon the length of these two incisions.

3. The recti muscles with their firmly attached flaps of the external sheath, fat and skin are rolled outward and held by suitable retractors widely exposing the posterior sheaths of both recti muscles. A transverse incision is made at the level desired through the exposed posterior sheath of the rectus and the peritoneum and extended across the linea alba parallel to the direction of the fibers from the outer edge of one rectus muscle to the outer edge of the other. Additional retraction upward and downward enlarges the opening to a surprising extent, the diameter of the opening being about equal to the length of the incisions made in the sheaths of the recti. The only blood vessels encountered in making this incision are some small subcutaneous ones, a small one or two on the surface of each rectus muscle and one or two in the falciform ligament near the linea alba. The nerve supply of no structure is destroyed.

For Operations on the Gall Bladder.—Retraction upward and outward exposes the region of the gall bladder, the liver, and the hepatic flexure of the colon. For cholecystectomy or cholecystotomy only the right half of this incision is usually required. For gall bladder operations one-half of the incision may be made and the transverse incision extended to the inner border of the left rectus muscle. This gives ample exposure for all operations upon the gall bladder, the common duct, the duodenum, and the pyloric end of the stomach. It usually provides room sufficient for a gastroenterostomy. Should more room be desired the incision may be extended on the other side with ease. When a cholecystotomy is performed, the drainage tube is brought out through a puncture wound and the gall bladder is brought to the abdominal wall at any point desired.

For Appendectomy.—Retraction of the opening downward and outward affords a better approach to the appendiceal region than is obtained by a longitudinal right rectus incision of any reasonable length.

For Splenectomy.—The left half of the incision is usually all that is required for splenectomy. The transverse incision should be made at a somewhat higher level than for gastrointestinal operations.

Closure of Posterior Sheath and Peritoneum.—The closure of this incision is quite simple as the transverse fibers have not been severed. If the closure of the peritoneum and posterior sheaths of the recti is begun at the outer ends of the transverse incision, no difficulty is experienced even with the largest and fleshiest patient, as no tension whatever is required to bring the edges together.

Closure of the Anterior Sheath.—The edges of the anterior sheath of the recti are brought together with No. 1 chromic catgut with surprising ease.

Superficial Structures.—No sutures are required in the subcutaneous layer of fat. Skin closure with skin clips is all that is required.

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(For discussion, see page 289.)

MURAL SARCOMA OF THE UTERUS, WITH A REPORT OF 13 CASES*

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SARCOMAS are malignant mesodermal tumors locally destructive and spreading systemically to other viscera by the blood stream. In the uterus the embryonal-like stroma of the endometrium and the fibromuscular components of the myometrium furnish respectively the groups of endometrial and mural sarcoma first differentiated by Virchow. Mural tumors arising in the myometrium, are further subdivided into primary or de-novo sarcomas, and a secondary group, arising in preexisting fibromyomas. The mixed sarcoma of the uterus is an embryonal tumor to be separately considered under de-novo uterine sarcoma.

The incidence of mural sarcoma though low is of special significance since the advent of radiotherapy in fibromyoma, for sarcoma arising in preexisting fibroids comprise a large number. Figures vary with the routine care in the examination of the specimens and as recorded in the literature vary from 1 to 9 per cent. O. Frankl tabulates 38 sarcomas in a group of 1,878 fibromyomas or 2.13 per cent. Of these, 15 were primary, including 3 mixed tumors of the uterus. Seventeen

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were secondary and 5 probably began in a preexisting fibroid. One specimen obtained by morcellation was inconclusive. The Gynecological Laboratory of the Long Island College Hospital received 510 specimens removed for supposed fibromyoma of the uterus from Sept. 1, 1923, to Dec. 1, 1929. Thirteen sarcomas were encountered, an incidence of 2.54 per cent. Of these, 8 were primary tumors including 2 mixed sarcomas of the body; and 5 originated in preexisting fibroids.

The histogenesis of sarcoma has been long debated. Among early authors, Virchow and Williams in particular, considered matured and adult muscle and connective tissue cells as progenitors of mural sarcoma. More recently studies by Robert Meyer, Oskar Frankl, and James Ewing indicate a myogenic origin from immature, embryonal mesodermal rests which take on varied growth potential. Maturing forms reproduce benign muscle and connective tissue cells as in fibromyoma. Immature cell types with rapid growth tendencies present as spindle, round or giant cell sarcoma. Myoma malignum (sarcoma myomatoides) holds an intermediary position for this group comprises seemingly benign growths which, however, locally recur and occasionally metastasize. In sarcoma arising in preceding fibroids orthotopic undifferentiated cells lose their growth restraint, rapidly proliferate and replace the benign cells of the antecedent tumor. The histogenesis of mixed sarcoma is attributed to wolffian duct rests.

Primary mural sarcomas as a rule are solitary and circumscribed but encapsulation is lacking. They most frequently occur in the body; cervical types generally belonging to the mixed sarcoma group. The primary tumors favor a submucous position; the secondary sarcoma are generally interstitial but in either group, submucous, interstitial and subperitoneal forms present. Of 8 primary tumors here reported (including the mixed type) 4 were submucous, 1 interstitial but growing toward the cavity, and 3 were entirely interstitial. Of 5 arising in fibromyoma, 3 were interstitial, 1 encroached upon the cavity, and 1 was truly submucous in type. Uterine sarcomas are round or oval and though varied in size are of moderate dimension. Those recorded in this series ranged from 2 to 17 cm. in diameter. Secondary hypertrophy of the myometrium is frequent, especially in submucous growths. The endometrium overlying the tumor is congested and long preserved. In advanced stages the tumors penetrate the submucous and peritoneal layers; in the latter instance resulting in direct implantation of malignant elements upon contiguous organs. On cut section the gross appearance of the tumors varies with maturity of the component cells and secondary nutrient disturbances resulting from venous compression or thrombosis. Tumors comprised of well differentiated muscle elements and designated as myoma malignum, mask as fibroids frequently escaping the recognition of clinician and pathologist until microscopic examination is made. Dannreuther re-

cently described four such cases. Grossly these sarcomas resemble benign fibromyomatous tumors because of their sharp circumscription and whorled appearance. The loss of the silky hue, sparsity of fasciculation, the softened consistency and difficulty in shelling from the capsule, however, are differential characters. Two gross specimens in this series (17058 and 17062) were of this type. More often sarcomas are recognizable by their grey-white opaque appearance, soft consistency and friability. Hemorrhage which is frequently encountered imparts a red, brown, or blue tint to segments or the whole of the tumor. The most rapidly growing tumors are brain-like in character, yellow-grey with an irregular margin. Thrombosis is especially marked in this group resulting in irregular cavities which represent the end stage of liquefaction necrosis.

In sarcomas arising in fibroids the gross appearance in early cases is distinctive. Irregular islands of sarcomatous tissue are placed within the sharply defined capsule of the fibromyoma. The dull, opaque, homogeneous appearance contrasts sharply with the defined whorls of the preserved fibromyoma. With continued growth, however, complete replacement may occur obliterating the landmarks of the preexisting benign fibroid. But in the great majority of instances distinction is possible by: (a) a peripheral zone of fibromyoma into which strands of sarcoma can be traced, (b) preservation of the capsule in part or, (c) sharp definition of the tumor where myoma is preserved in entirety at the periphery, contrasting strikingly with the irregular border where malignancy has occurred, and (d) the silky gloss and whorled appearance of fibromyoma contrasts with the homogeneity and opacity of the sarcoma. Since fibroids are most commonly interstitial this position is most commonly preserved when secondary sarcoma appears but subperitoneal and submucous types are also met. Otherwise the gross characters of the secondary sarcomas are essentially as noted in the primary group. The mixed sarcomas are separately considered below.

Morphologically in both primary and secondary sarcoma pure cell forms are rare, mixed types the rule, so that round, spindle, and giant sarcoma cells frequently intermingle. In the primary form a purely spindle cell group exists which is deservedly designated as myoma malignum. Its component cells approach mature, smooth muscle fibers. They are large, spindle in form and arranged in parallel columns forming concentric whorls or more frequently wide, irregular, interlacing sheaths. The cytoplasm is abundant, myoglia are differentiated. The nuclei are centrally placed, short, wide and hyperchromatic. Variation in size and form is not marked. Mitoses are infrequent. Sparse numbers of undifferentiated, spindle and giant cells may, however, be intermingled. Three primary cases (17058,

17622 and 17401) were of this type although grossly only two showed characters of myoma malignum. The cervical sarcoma microscopically also presented the characters of this group. In the majority of primary and secondary sarcomas the constituent spindle cells possess greater growth potency and differentiation is less complete. The cell borders are poorly defined; cytoplasm is scant; myoglia are lacking. The nucleus is relatively large and extremely varied in shape and form which varies from spindle to fusiform or oval. Both vesicular and solid nuclear types are intermingled and mitotic figures are numerous. Yet the tendency for grouping of the component cells in intertwining sheaths is persistingly recognizable indicating the myogenic origin. Admixtures of small spindle, round, fusiform, polymorphous and giant cells are encountered in varying proportions. Blood vessels are plentiful and though of the capillary type are of sinusoidal dimension. Thrombosis results in large areas of necrosis. In this series of thirteen cases, seven reproduced this anaplastic cell pattern, two belonging to the primary and five to the secondary group of sarcoma. Giant cells commonly met in sarcomas were prominent in nine cases of this series, and were noted even in myoma malignum.

The mixed tumors of the uterus though rare deserve special mention. They are regional bidermal teratomas, in which malignant or blastomatous changes predominate and reproduce sarcoma, carcinoma and adenosarcoma. Their relation to the true teratomas is best shown in the case reported by Ribbert in which neurogenic derivatives were also found. According to Wilms they arise from embryonal rests scattered along the wolffian ducts and contain glandular and supporting mesodermal elements. The cervix is the seat of election. The body form is extremely rare and W. Shaw notes only 14 recorded cases in the literature until 1929. Mixed sarcomas of the body are generally submucous; pedunculated or sessile in type. Size is extremely varied. Histologically they are largely comprised of malignant embryonal mesodermal cells so that round and spindle cell sarcoma predominates. Differentiation results in the appearance of fibrous tissue, smooth and striated muscle, mucoid, osteoid and cartilage. Gland elements are intermingled. They are huge in size, lined by a tall ciliated columnar cell typically endometrial. Mucous secreting glands may be encountered. Two cases of mixed sarcoma of the body of the uterus (16501 and 18785) are included in this series, both submucous in position filling and dilating the endometrial cavity. Grossly the high myxomatous content was particularly striking. Histologically fibromyxosarcoma comprised the bulk of the tumors but hyalinized cartilage and smooth muscle and osteoid were differentiated. Endometrial glands of huge size were noted as also smaller mucous secreting glands of the cervical order as noted in the second case.

Clinical Aspects.—Sarcomas of the uterus are met at every age but occur most frequently after menopause, most prominently in the fifth to sixth decade. In this series two cases were encountered between the ages of twenty to thirty, two cases between the ages of thirty to forty, three cases between the ages of forty to fifty, six cases between the ages of fifty to sixty. Predominant clinical symptoms were as follows: (1) Vaginal bleeding was noted in 11 of 13 cases; its severity was varied but flow was always persistent, (2) palpable abdominal tumor was noted by 4 patients and recorded as rapidly growing by one, (3) abdominal pain of moderate severity was noted in four instances, most marked in one patient with sigmoidal involvement. Physical examination as a rule presented an enlarged, symmetrical uterus in the primary group. In the secondary sarcomas the uterus was generally irregular due to the concomitant benign fibromyomas. The cervical sarcoma presented as a polyp projecting from the external os. The true condition was seldom suspected for 11 of 12 cases of body sarcoma were diagnosed as benign fibromyoma. The cervical growth was considered a carcinomatous polyp. Since fibromyomas rarely produce symptoms after the menopause, the advent of bleeding at this age should suggest malignancy. Carcinoma of the body can be readily excluded by curettage, a procedure of decided value in establishing the diagnosis of uterine sarcoma. As emphasized by O. Frankl in his series, 14 of 15 primary uterine sarcomas and 7 of 22 secondary sarcomas encroached upon the endometrial cavity. In our series 5 of 8 de-novo and 2 of 5 secondary sarcomas reached the endometrium affording material for diagnostic curettage and histologic examination in over $\frac{1}{2}$ of the cases. If tissue is not obtained by this procedure, immediate gross examination of operative specimens is in order if patients are subjected to hysterectomy for fibromyomas at or after menopause.

Treatment.—To be successful depends upon early diagnosis. This possibility may be afforded by curettage as just emphasized. With the correct diagnosis established and the growth limited to the uterus, complete extirpation of uterus, adnexa and parametrium followed by intensive deep x-ray should be the therapeutic rule. With infection of the tumor or severe anemia, this procedure has an initial primary mortality. In this event local excision of the tumor if accessible followed by radiation has been suggested by Halbrecht. Cases with broad ligament extension or established metastases to contiguous or distant viscera warrant only palliative radiation. Since the diagnosis of uterine sarcoma, is as a rule first established after operation, only supracervical hysterectomy and bilateral salpingo-oophorectomy has been performed. With myoma malignum or early secondary sarcomas well encapsulated in the preexisting fibroid, retention of the cervical stump is not of grave moment. Application of radium into the cervi-

cal canal followed by deep x-ray offers fair chances for recovery. In the advanced cases combination of surgery and radiotherapy is of doubtful accomplishment. Schreiner reporting 8 advanced cases treated in this manner, finds only one patient symptom-free about five years following operation. In this series of 13 sarcomas 7 patients were treated by supracervical hysterectomy and bilateral salpingectomy and one by supracervical hysterectomy and left salpingo-oophorectomy. Wide excision of the parametrium was not practiced for the diagnosis was not suspected. There were no immediate operative deaths in this group. Two patients, however, died within six months after operation from local recurrence; one nine months after operation from peritoneal metastasis and intestinal obstruction in spite of adequate deep x-ray therapy. Of the five living patients treated by supracervical hysterectomy (of which only one was treated by x-ray) all are symptom-free for intervals varying from six to fourteen months following operation. But it must be emphasized that in this group are included two cases of myoma malignum (17058 and 17622) and two cases of well encapsulated sarcomas arising in fibroid (15019 and 18232). Four patients were treated by panhysterectomy with one postoperative death, the result of peritonitis (18785). A second patient (11912) died six weeks after operation from angina pectoris. Of the surviving two; one is alive and well two years after operation and one symptom-free six months after operation although no radiation was employed in either instance (13659 and 17991). The cervical case treated palliatively by radiation because of broad ligament involvement is alive ten months after radium insertion. Recurrent bleeding and advancing infiltration has necessitated the administration of a second dose. The therapeutic possibilities of radiation alone in uterine sarcoma must be mentioned. Seitz and Wintz report 18 cases of which 11.1 per cent are cured after five years and 55 per cent symptom-free one to three years after treatment. The results were even better in the secondary sarcomas.

The prognosis of uterine sarcoma is always grave. It is dependent upon the duration of clinical symptoms, the site of tumor and the growth potential of its component cells. The first two factors are correlated. Primary sarcomas are more frequently submucous; bleeding therefore appears relatively earlier and medical intervention is more prompt. (Bleeding was recorded in 14 or 15 cases of primary sarcomas by O. Frankl.) In the group arising secondarily in fibroids bleeding may be entirely lacking or appear late because of the interstitial seat commonly held by fibroids. Encapsulation, however, delays local spread of the growth. The growth potential of the tumor may be gaged by the cell morphology. In primary sarcoma the purely spindle cell type designated as myoma malignum is slowly growing circumscribed and relatively benign for it can be entirely extirpated by

complete hysterectomy. Ewing in an experience of twenty years found only 3 cases of systemic metastases and only 2 with local recurrences. Of 4 patients with such morphology in this series 2 are symptom-free. The less differentiated spindle cell types hold an intermediary position as to malignancy. They invade uterine wall, parametrium and endometrium. In case (26191) of this type recurrence in the cervical stump was prompt and at autopsy performed four months later, peritoneal, omental and visceral deposits are noted. Embryonal, small spindle, and round cell sarcomas are most rapidly growing and destructive from the first and cause early systemic metastases. In sarcomas arising secondarily in preexisting fibroids prognosis varies with the extent of the growth and the cell type. Centrally placed tumors well capsulated may be completely extirpated by surgical means. The histology of the cell as in primary sarcomas determine the relative rate of growth. In both groups extension ultimately follows especially into the broad ligaments, retroperitoneal tissues and lymph nodes. Ovaries and tubes are involved by continuity and implantation. Sarcomatous thrombi in vessels account for pulmonary, hepatic and bony metastases. Local recurrence is the general rule in advanced cases in spite of complete hysterectomy or radiation.

CONCLUSIONS

1. Mural sarcoma of the uterus comprises a primary or de-novo group and a secondary form occurring in preexisting fibromyomas. Both are of myogenic origin and arise from orthotopic embryonal rests in the uterine wall or within the confines of a preceding fibromyoma. The mixed sarcoma of the uterus is a primary sarcoma of the teratoid type.

2. The degree of maturation of the component cell determines gross appearance, rate of growth and clinical malignancy of these tumors. (a) Tumors comprised of differentiated muscle cells (myoma malignum) clinically and grossly pose as fibromyomas. They are slow growing, rarely recur or metastasize. (b) More actively growing forms appear as spindle, fusiform and round and giant cell sarcomas. Grossly they are homogeneous and opaque; infiltrate relatively early and metastasize by the blood stream. (c) Mixed sarcomas comprised of embryonal elements grow rapidly and recur promptly. Cell differentiation produces mucoid, smooth and striated muscle, osteoid and cartilage; glands are of local stamp.

3. The site of the tumor determines the clinical mode of onset. Primary sarcomas more frequently submucous produce bleeding relatively earlier and more constantly than in the secondary group arising in interstitially placed myomas.

4. Both types are most prevalent after menopause, when fibroids as a rule are inactive.

5. Diagnostic curettage will yield material for pathologic diagnosis in 50 per cent of primary and secondary sarcoma. Uteri removed for supposed fibroids after menopause require immediate gross pathologic examination to exclude sarcoma.

6. Radical extirpation followed by postoperative radiation is indicated in growths still confined to the uterus. Palliation by radiotherapy should be the rule for advanced cases.

7. Prognosis though generally grave is surprisingly good in myoma malignum. Sarcomas arising in fibroids offer fair prognosis, if of small size and confined within the capsular limits of the original growth.

Thanks are extended to Drs. John O. Polak, Gordon Gibson, H. B. Matthews, Wm. A. Jewett and A. C. Beck, for permission to report their cases.

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RÉSUMÉ OF CASES

PRIMARY SARCOMA

CASE 1.—(13304) Mrs. C. C., aged thirty-three; nullipara, admitted March 10, 1924, complaining of vaginal discharge and prolonged menses. Six months prior to admission menses previously of four days' duration increased to seven days. For the past five weeks, bleeding has been persistent. Uterus found enlarged to the size of a four months' gestation. Supracervical hysterectomy and bilateral salpingo-oophorectomy performed for suspected fibromyoma. Postoperative course uneventful, no radiation. Patient reported dead four months after operation. Pathologic Report: Uterus: was globoid, symmetrically enlarged and measured 15 × 10 × 8 mm. The solitary tumor found in the posterior wall measures 8 cm. in diameter; its growth direction was centripital with encroachment upon the cavity. On section the tumor was opaque, soft, grey-white; border was irregular. No capsule was evident. Areas of necrosis, thrombosis and cystic changes were common. Microscopically: Sections from the periphery of the tumor failed to reveal evidence of preexisting fibromyoma or capsule. Tumor was comprised of fusiform and spindle cells arranged in parallel intersecting columns or whorls. Cytoplasm was moderately granular, myoglia were reproduced. Nuclei were irregularly oval, varying in size, shape and staining capacity and were centrally placed. In the central portion of the tumor differentiation was less marked; cells were spindle, no myoglia were reproduced. Nuclear irregularity was more prominent; giant cells were numerous. Huge capillary sinusoids were numerous. Tubes and ovaries showed no abnormalities. Diagnosis: Primary mural sarcoma.

CASE 2.—(13655) Mrs. A. F., aged forty-six, was admitted Oct. 8, 1926, complaining of vaginal bleeding for the past six months. Examination revealed the uterus enlarged to the size of a six weeks' pregnancy. Diagnosis: Fibromyoma. Complete hysterectomy, bilateral salpingo-oophorectomy Oct. 10, 1926. Postoperative course uneventful. No radiation. Well when last seen November, 1928.

Pathologic Report: Uterus was typically pyriform and measured $7 \times 5 \times 3$ cm. Cervix was normal. Posterior body wall presents an interstitial ovoid tumor measuring $2\frac{1}{2}$ cm. wide, centrally placed at the level of the uteroovarian ligaments. On section the tumor was not encapsulated, grey, opaque; focally hemorrhage was present. Metastatic nodules 1 to 3 mm. in diameter were encountered in the adjacent myometrium reaching practically to the serous coat. Microscopically: Sections from the uterus and tumor-free zone were essentially negative. Tumor and the focal metastasis presented a similar structure. Constituent cells were small, spindle, fusiform and of the large round cell type. Cytoplasm was scant. No myoglia were reproduced. Nuclei were spindle, ovoid or round and vary strikingly in size, shape,

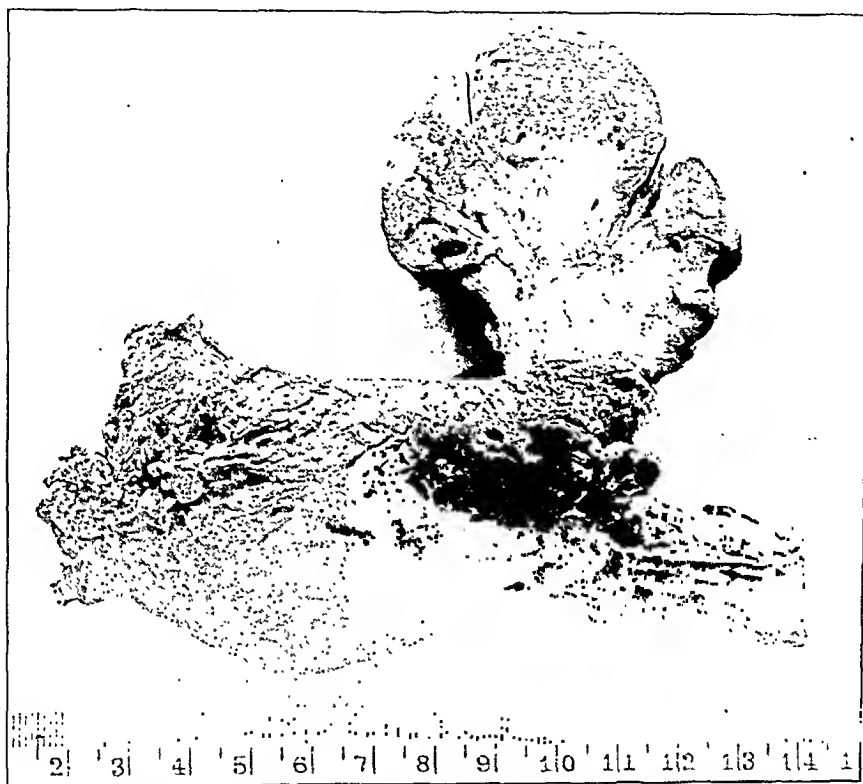


Fig. 1.—Primary sarcoma of the uterus, submucous type. Note the opaque grey homogeneous structure in the center. Thrombosis is marked. There is no evidence of a capsule. (Specimen Case 1.)

and staining capacity. Mitotic figures were numerous. The vessels were numerous, thrombosis was marked due to plugs of tumor cells. No capsule or remnants of fibromyoma were encountered. Tubes and ovaries were free from changes. Diagnosis: Primary mural sarcoma, interstitial, spindle and round cell type.

CASE 3.—(16364) Mrs. A. A., aged fifty-six, admitted March 11, 1928, complaining of vaginal bleeding of two months' duration. Menstrual 14—28—4, menopause at the age of forty-four. Gravida i, para i. Physical examination: Cervix thickened to twice its normal size and fixed; os patulous and presented a hemorrhagic polyp 2×1 cm. Body of uterus anterior, small. Both parametria were infiltrated. Diagnosis: Polypoidal carcinoma of cervix. Parametrial extension. Operation March 13, 1928. Biopsy of cervix, insertion of radium (dose 3,300 mg. hr.). Leucorrheal discharge persisted since discharged from hospital in March, 1928. Moderate bleeding recurred October, 1929. A second dose of radium of

2,400 mg. hr. was given Nov. 30, 1929. Cervix was atrophic and flush with vaginal vault. Parametrial infiltration of both broad ligaments persisted. Pathologic Report: The several fragments submitted for study presented essentially similar changes. The surface was lined by necrotic and infected tissue. More deeply tumor elements were preserved, comprised of spindle and fusiform cells arranged in broad sheaths. Interlacing was demonstrated with moderate frequency. Cell borders were poorly defined, cytoplasm was abundant; fibrillae were differentiated. Nuclei were spindle and fusiform in type, varying decidedly in size, shape, and staining capacity. Giant cell forms were encountered. In several areas small spindle cell sarcoma was reproduced. Blood vessels were numerous. No fibro-

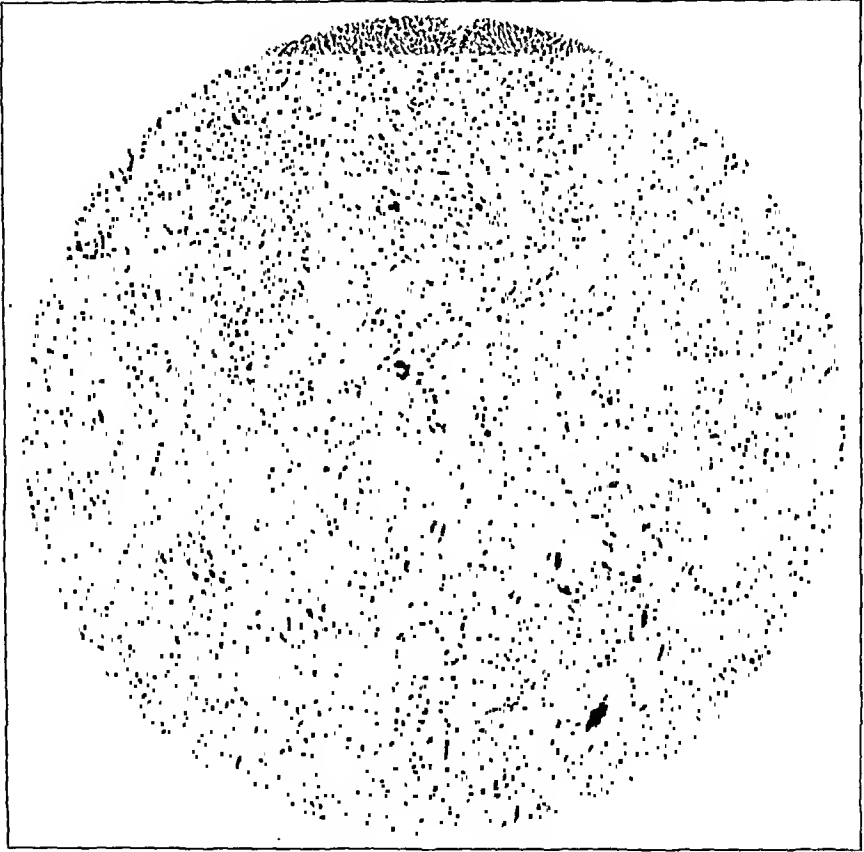


Fig. 2.— $\times 80$. Primary myosarcoma. Note the interlacing sheaths of large, spindle cells resembling involuntary muscle. Cell borders are well defined, cytoplasm is granular and nuclei centrally placed. Mitosis is frequent. The numerous giant cells are prominent. (Section from Case 1.)

myomatous or cervical glandular elements were noted. Diagnosis: Primary cervical myosarcoma, bilateral, parametrial infiltration.

CASE 4.—(17058) Mrs. H. B., aged fifty, admitted Sept. 18, 1928, complaining of vaginal discharge and enlargement of abdomen for the past year. Menstruation is regular. Abdomen is enlarged presenting tumor the size of a six months' pregnancy arising from pelvis. Clinical diagnosis: Fibromyoma. Operation Sept. 20, 1928. Supracervical hysterectomy, bilateral salpingo-oophorectomy. Postoperative course uneventful, no postoperative radiation. Reported symptom-free by family physician to date. Pathologic report: Uterus removed by supracervical hysterectomy, pyriform and measures $17 \times 17 \times 7\frac{1}{2}$ cm. The organ was the seat

of multiple fibroids, the largest one 10 cm. interstitial in type, was located in the right anterior and lateral walls. A second tumor filled the left half of the organ and measured 13 cm. in diameter. It encroached upon the cavity which it displaced obliquely and to the right. Endometrium was atrophic over this fibroid; the serosa was edematous. Pedunculated subperitoneal myomas varying from 2 to 4 cm. were located on the posterior wall. On section the large tumor in the left wall was grossly edematous; the usual shimmer was lacking. The border was circumscribed, capsule was not sharply defined. The remaining tumors showed the usual silky hue and whorled appearance of fibroids and presented atypical capsule. Microscopically: The endometrium corresponded to the postmenstrual phase. The myometrium was normal except for congestion. The fibroids presented the usual structure, consisting of muscle and connective tissue cells. The large tumor above noted was comprised of huge, spindle cells coursing in parallel sheaths intersecting at right angles or arranged in concentric whorls. The cell cytoplasm was abundant, fibrillar. The nuclei were large, ovoid or cigar shaped and centrally placed. Giant cells were not uncommon and served for the differentiation from benign cellular myoma. Capillary sinusoids were abundant. Areas of edema and liquefaction necrosis were numerous. Remnants of preexisting fibromyoma were not demonstrated. Capsule was lacking. Tubes and ovaries presented no pathology. Diagnosis: Primary mural sarcoma, myoma malignum.

CASE 5.—(17401) Mrs. I. B., aged fifty-nine, admitted Dec. 5, 1928, complaining of vaginal bleeding and pain in the left lower quadrant. Married forty years, gravida 9, para 9, menopause at the age of forty-five. Cervix was found atrophic. Uterus enlarged to the size of a two months' pregnancy; soft, indefinite fullness present in left lateral fornix. Supracervical hysterectomy, bilateral salpingo-oophorectomy performed. Sigmoid covered with adhesions. Postoperative course uneventful. Four deep abdominal x-ray treatments. Examination Oct. 7, 1929. No symptoms, no evidence of local or general metastases. Pathologic Report: Uterus removed by supracervical hysterectomy globoid measuring $7 \times 15 \times 6$ cm. The posterior fundal wall was covered with firm adhesions. Uterine cavity was dilated and filled with a lobular, pedunculated tumor measuring $7 \times 7 \times 5$ cm. Its consistency was soft. On section the color varied from red to blue-black, the result of interstitial hemorrhage. The outer third was necrotic; central area presented a homogeneous opaque grey-white appearance. No evidence of capsule was grossly demonstrable. Microscopically: Over the central portion of the tumor, endometrium was still preserved. The stroma, however, was replaced by tumor elements as encountered in the tumor proper. The constituent cells were large, spindle, arranged in broad interlacing fasciculi. The cell cytoplasm was abundant; borders well defined. Fibrillae were reproduced. Nuclei were large, oval or spindle in form and generally centrally placed. Hyperchromatism was prominent, mitosis frequent. Giant cells were frequent and presented single or lobulated nuclei. Capillary sinusoids were numerous; thrombosis is frequent. No signs of capsule were present. Tubes and ovaries were free from changes. Diagnosis: Primary mural sarcoma, submucous.

CASE 6.—(17622) Mrs. C. H., aged thirty-seven, admitted Feb. 9, 1929, complaining of profuse menstruation, swelling in lower abdomen and dysmenorrhea for the past year. Married three years, gravida 2; para 2. Last menstrual period Jan. 18, 1929. Uterus is enlarged by multinodular tumors. Preoperative diagnosis: Multiple fibroids. Supracervical hysterectomy and bilateral salpingo-oophorectomy performed, Feb. 13, 1929. Postoperative course uneventful. No x-ray or radium employed. Last examination September, 1929. General condition good. No complaints, no local or systemic metastases. Pathologic Report: Uterus was en-

larged and irregular, it measured $11 \times 11 \times 10$ cm. and presented numerous small sessile fibroids distributed throughout the posterior, body and fundal walls. A large interstitial myoma 8 cm. in diameter was placed in the right anterolateral wall but did not encroach upon the cavity, though the latter was somewhat irregular. The endometrium presented no abnormalities. Myometrium was normal. On section the large tumor growing toward the cavity was soft in consistency; fasciculi present were poorly defined. Areas of liquefaction necrosis were frequent. No capsule was grossly demonstrable. Other tumors presented the usual silky hue and whorled appearances of benign fibromyoma. Microscopically: The endometrium was of the premenstrual type. Myometrium was normal in the tumor-free zone. Section from the large tumor presented the picture of cellular myoma through many areas. Component cells were large, spindle and arranged in broad interlacing or crescentic sheaths. Cytoplasm was abundant, nuclei though hyperchromatic were cigar shaped and regular. Infrequently atypical giant cell forms were encountered with a large solid staining or multilobular vesicular nucleus. Here the component spindle cells assumed a fusiform or irregularly ovoid type. At the junction with the myometrium no sinuses or capsular elements were demonstrated. Tubes and ovaries presented no pathology. Diagnosis: Primary mural sarcoma, myoma malignum.

MIXED SARCOMA

CASE 7.—(16501) Mrs. M. D., aged fifty-five, admitted Aug. 20, 1928, complaining of abdominal tumor and foul discharge noted for eight months before admission. Married thirty-seven years, gravida i, para i. Uterus found symmetrically enlarged to the level of the umbilicus. Clinical diagnosis: Fibromyoma. Operation: Supracervical hysterectomy, bilateral salpingo-oophorectomy. One deep x-ray treatment following operation. Prompt local recurrence with diffuse peritoneal metastases. Patient died May, 1929, nine months following operation. Pathologic Report: Uterus was irregularly enlarged and measured 14×8 cm. It was the seat of multiple interstitial fibroids. On incision the cavity was filled with a sessile lobulated tumor reaching from fundus to level of transection. Tumor was dull, grey-white, opaque and extended into the myometrium for 5-40 mm. Focally, necrosis and areas of myxoma were encountered. The remaining fibroids presented the usual silky hue and whorled appearance. Microscopically: the tumor was largely comprised of fibromyxosarcoma. Islands of osteoid, smooth muscle and hyaline cartilage were present. Endometrial glands of embryonal nature were present. Epidermoid metaplasia was not uncommon. Tubes and ovaries presented no pathology. Diagnosis: Mixed sarcoma of the uterus.

CASE 8.—(18785) Mrs. A. V., aged forty-six, admitted Sept. 19, 1929, complaining of vaginal bleeding and backache. Married seventeen years, gravida 17, para 14. Menstrual 12—28—6. In January, 1927, a dose of 1,500 mg. hr. of radium was administered for endometrial hyperplasia (confirmed by slide). Amenorrhea persisted for one and a half years thereafter. Bleeding recurred July, 1929, and persisted until admission. Several, large, necrotic tissue fragments were expelled during August and September. Curettage Sept. 21, 1929, revealed fibromyxosarcoma. Operation Nov. 26, 1929. Complete hysterectomy, bilateral salpingo-oophorectomy. Patient died three days after operation from postoperative peritonitis. Pathologic Report: Uterus was globoid, and measured $13 \times 11 \times 8$ cm. Omental adhesions presented in the region of the fundus. Uterine cavity contained a globoid tumor lying in the posterior wall reaching from fundus to portio measuring 10×5 cm. Overlying endometrium was necrotic; encapsulation was lacking. Medial half of the tumor was blue-black in color, result of interstitial hemorrhage. The basal half presented frequent areas of myxomatous tissue. The remainder of the the

uterus presented no gross pathology. Microscopically: The bulk of the tumor was comprised of embryonal mesodermal elements and fibromyxosarcoma largely predominated. Focally clusters of smooth muscle were differentiated. Islands of well-matured hyaline cartilage were present. Glands of the cervical and endometrial type were encountered. Tubes and ovaries presented acute and subacute salpingo-oophoritis. Diagnosis: Mixed sarcoma of the body, acute and subacute salpingo-oophoritis.

FIBROIDS ARISING IN SARCOMA

CASE 9.—(11192) Mrs. C. N., aged fifty-two, admitted Nov. 16, 1924, complaining of pain in the lower abdomen and vaginal bleeding. Menopause occurred at the age of forty-seven. Symptoms began two weeks prior to admission to the hospital. Uterus found enlarged, reaching 8 cm. above the symphysis. Complete hysterectomy and bilateral salpingo-oophorectomy performed Nov. 24, 1924, culdesac, and sigmoid evidently involved. Postoperative course uneventful. No postoperative radiation. Patient died Dec. 24, 1924, one week after discharge from the hospital, evidently of coronary thrombosis. Pathologic report: Uterus symmetrically enlarged, ovoid in form measuring $14 \times 10 \times 8$ cm. Uterine cavity was dilated, filled with a pear-shaped submucous tumor 10 cm. in diameter, arising by a wide pedicle from the central fundal zone. Tumor also extended through the uterine wall reaching the serous coat. On section the right half of the tumor presented the whorls and silky hue of fibroid. In this segment a well-defined capsule was retained. The left half was soft, necrotic and edematous. Islands of myxoma were grossly recognizable. Microscopically: the tumor was comprised of whorls of large spindle cells concentrically arranged. The cell border was sharply defined. Cell cytoplasm was abundant and granular. The nuclei were short, wide and moderately hyperchromatic. Mitotic figures were numerous. In the myxomatous zones grossly noted extensive edema had caused fraying of the cells. The cytoplasm was lacking or precipitated in irregular granules. The nuclei of these cells were pale, round or oval. True spider cells were not encountered. Thrombosis and necrosis were widespread. Tubes and ovaries presented no pathology. Diagnosis: Sarcoma arising in fibroid, submucous.

CASE 10.—(15019) Mrs. A. H., aged forty-seven, admitted March 27, 1928, complaining of abdominal pain and menorrhagia for the past three months. Married twenty-one years, gravida 2, para 2. Last menstrual period March 12, 1928. Uterus was irregularly enlarged by multiple fibroids and reached the level of the umbilicus. Supracervical hysterectomy and bilateral salpingo-oophorectomy performed March 3, 1928, for supposed fibroids. Postoperative course uneventful, no postoperative radiation. Nov. 3, 1928, seven months after operation, the general condition was good; cervical stump high, no local recurrence. Pathologic Report: Uterus was enlarged and distorted by multiple fibroids and measured $18 \times 14 \times 6$ cm. Multiple interstitial fibroids varying from 11 to 4 cm. were distributed through all walls. A submucous myoma 7 cm. in diameter dilated the cavity. The largest tumor measured 11 cm. in diameter and lay in the anterior wall of the organ. On section it presented several mucoid areas varying from 2 to 4 cm. in size which were dull and homogeneous. The remainder of the tumor was glossy and presented prominent whorls. Capsule was well differentiated. Remaining tumors present the usual silky hue and whorled appearance. On section the opaque areas in the large tumor were comprised of large spindle cells coursing in broad parallel columns. Interlacing, however, was not marked. Cell cytoplasm was abundant and granular. The nucleus was centrally placed. The latter presented extreme variation in size, shape and staining affinity. Giant types were not uncommon. Zones of small spindle and fusiform sarcoma were also encountered.

The benign fibromuscular elements of the preexisting fibroid were well shown at the peripheral portion of the tumor. Tubes and ovaries presented no pathology. Diagnosis: Sarcoma arising in fibroid.

CASE 11.—(17991) Mrs. M. O., aged fifty-three, admitted Feb. 26, 1928, complaining of vaginal bleeding and pain in the lower abdomen. Menopause occurred at the age of forty-three. Symptoms present for eleven months. Abdominal examination revealed a tumor extending from the pelvis reaching 8 cm. above the pubis. Cervix is small and atrophic. Clinical diagnosis: Sarcoma of the uterus. Complete hysterectomy and bilateral salpingo-oophorectomy performed March 2, 1929. Postoperative course was uneventful. No postoperative radiation. Last exam-

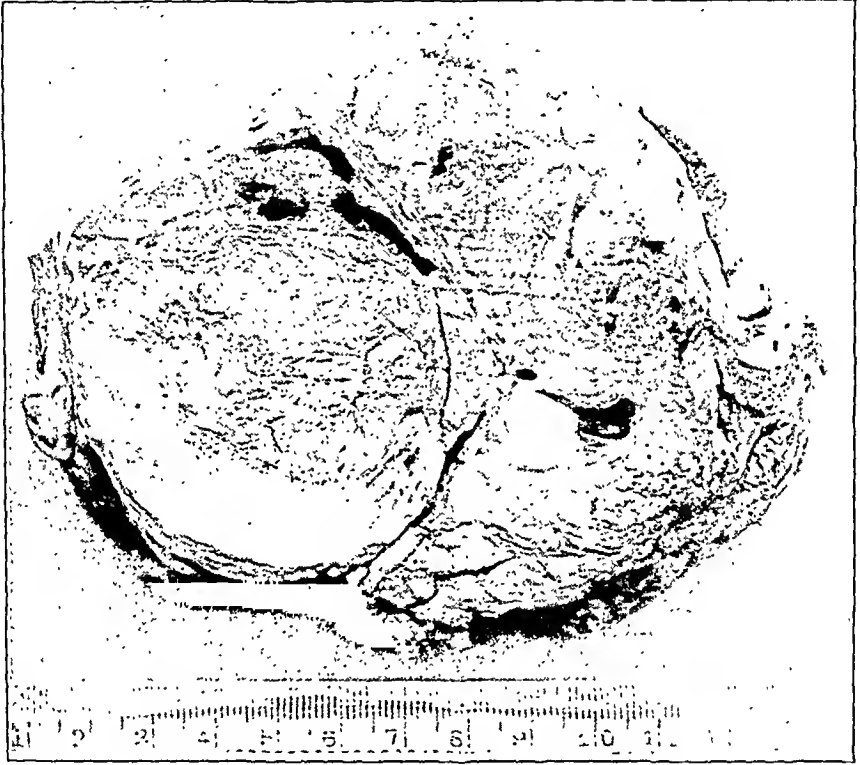


Fig 3.—Sarcoma arising in fibroid. The interstitial tumor preserves its capsule. A crescentic zone at the periphery is opaque and homogeneous. Dark coloration is result of interstitial hemorrhage. Extension into the myometrium is marked. Contrast the whorled appearance of the benign fibromyomatous elements with the homogeneous appearance of the sarcoma areas. (Case 11.)

ination Oct. 18, 1929 (seven months after operation) revealed general condition good, no evidence of local recurrence. Pathologic report: Uterus was globoid and measured $15 \times 13 \times 11$ cm. Cervix presented senile atrophy. A small interstitial myoma 2 cm. in diameter presented in the anterior fundal wall. A second tumor 8 cm. in diameter presented posteriorly occupying fundus and body. The endometrial cavity was elongated and compressed due to centripital growth of the tumor. The overlying endometrium was necrotic. On section the tumor was sharply circumscribed, the capsule well retained. For descriptive purposes, it was divided into two zones; an upper segment measuring 7×2 cm., was largely necrotic but presented islands of preserved grey-yellow brain-like tissue. The remainder presented the usual hue and whorled appearance of fibromyoma. In this segment the capsule was well retained. Invasion of the tumor into the contiguous myo-

metrium had occurred, and gray opaque islands of tumor tissue were everywhere in evidence. Microscopically: The tumor was comprised of spindle and fusiform cells arranged in indistinct but recognizable sheaths which intertwine. Cell cytoplasm was scant. No myoglia were reproduced. Nuclei varied from oval to fusiform to spindle in shape. Hyperchromatism was marked; mitotic figures were frequent. Giant cells with solid nuclei were encountered. In the fibroid segment, typical arrangement of constituent benign muscle and connective tissue was noted. The capsule was well preserved. Tubes and ovaries presented no changes. Diagnosis: Sarcoma arising in fibroid.

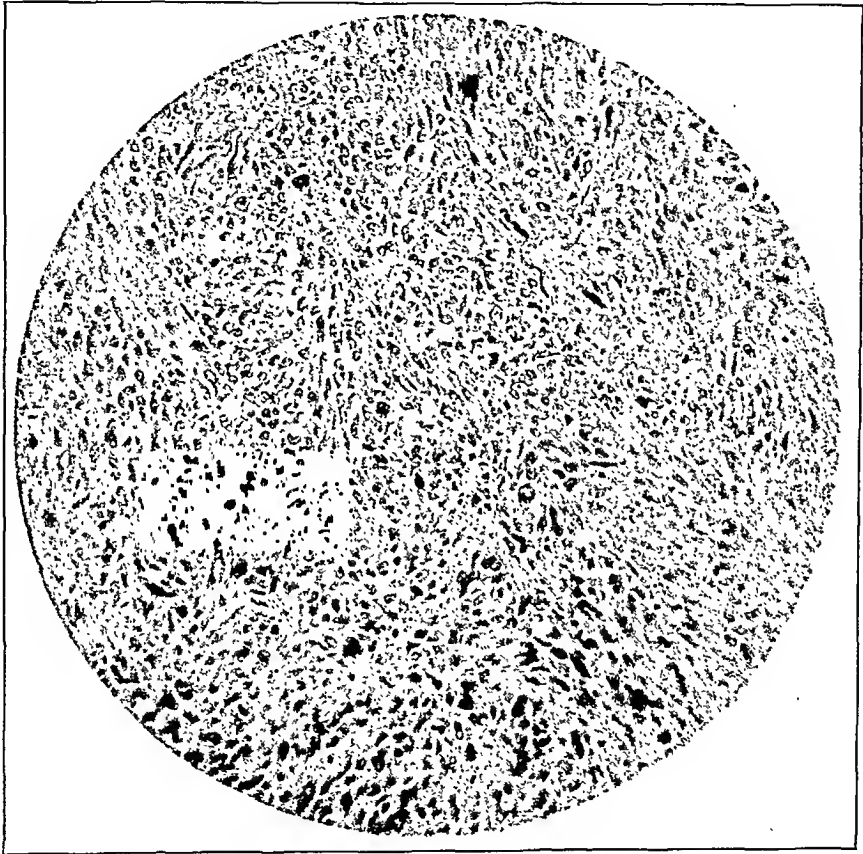


Fig. 4.— $\times 120$. This sarcoma is comprised of spindle and fusiform cells. Sheaths are poorly defined but recognizable. Cell cytoplasm is scant; nuclei are oval, round or spindle in form. Hyperchromatism is marked, mitosis numerous. Large giant nuclei are also encountered. (Case 11.)

CASE 12.—(26-19-1) Mrs. A. E., nullipara, aged twenty-five, admitted Dec. 5, 1923, complaining of abdominal mass noted as rapidly growing for three months before admission. Myomectomy performed at the age of seventeen for excessive bleeding. Menstruation normal following operation. Abdomen presented large soft tumor, relatively symmetrical reaching level of the umbilicus. Supracervical hysterectomy and bilateral salpingo-oophorectomy for supposed fibroid performed Dec. 8, 1923. Postoperative course uneventful. Three postoperative deep abdominal x-ray treatments. Readmitted April, 1925, with symptoms of intestinal obstruction. Peritoneal cavity filled with tumor metastasis. Death occurred May 14. Autopsy revealed omental and peritoneal metastasis. Retroperitoneal deposits 14 cm. in diameter encountered at the root of the mesentery. Pathologic Report: Uterus was sym-

metrical, globular and enlarged to the size of a four months' gestation by a solitary tumor in the posterior wall measuring 18 cm. in diameter. On section a well-preserved capsule was noted at the periphery. More prominent in the inferior half were irregular opaque islands of grey-yellow tissue varying from 1 to 4 cm. in diameter. Extension into the contiguous muscle had occurred. Microscopically: The tumor presented sheaths of interlacing spindle cells. Cytoplasm was moderate. Focally fibrillae were produced. Nuclei were oat shaped, round or oval. Hyperchromatism was marked. Large solid nuclei were common. Giant cells were encountered. Capillaries were sinusoidal in type. Tubes and ovaries were free from changes. Section of metastases obtained at autopsy revealed wide ovoid and fusiform cells arranged in broad columns. The cell outline was well defined; cytoplasm was vacuolated and abundant. Huge nuclei, round, oval or biscuit shaped were present. Giant forms were numerous. Some of the nuclear changes were evidently the result of radiation. Capillaries were sinusoidal and numerous. Diagnosis: Sarcoma arising in fibroid, local recurrences, peritoneal metastasis.

CASE 13.—(18232) Mrs. M. M., aged twenty-six, admitted June 27, 1929, complaining of abdominal mass and irregular vaginal bleeding for eight months. Married ten years, widow two years; one pregnancy, terminated in abortion. Examination showed uterus enlarged, extending from pelvis to the right iliac fossa reaching 8 cm. above Poupart's ligament. Clinical diagnosis, fibromyoma. Operation June 29, 1929. Supracervical hysterectomy and right salpingo-oophorectomy. Postoperative course uneventful; no postoperative radiation. Examination December, 1929, six months after operation showed no evidence of local recurrence; general condition good. Pathologic report: Uterus heart-shaped, regular, measuring $10 \times 12 \times 10$ cm. All walls held interstitial fibromyomas varying from 3 to 6 cm. in diameter. A pedunculated myoma in the posterior wall measured 6 cm., was well circumscribed but on section was dull with sparse fasciculi. The remaining fibroids presented the usual luster and whorled appearance. Endometrial cavity and uterine musculature were free from changes. Microscopically: The endometrium presented changes of the interval phase. The myometrium was dissected by sinusoids. Section from the central tumor presented the following: The bulk of the tumor was comprised of fusiform and spindle cells coursing in broad parallel sheaths. The cell boundary was fairly well shown. Cytoplasm was moderate and granular. Nuclei were generally short, oval with blunted ends. Hyperchromatism was marked. Variation in size and shape was not uncommon. Solid giant forms were occasionally noted. In several segments large, round cell forms were present. Sheaths of benign muscle and connective tissue cells were irregularly distributed. A capsule was sharply demarcated at the periphery but clusters of tumor cells had extended into the vessels which were of sinusoidal type. Right tube and ovary presented no pathologic changes. Diagnosis: Sarcoma arising in fibroid, interstitial.

1530 PRESIDENT STREET.

THE ELECTIVE CESAREAN SECTION AS A PROPHYLACTIC MEASURE AGAINST OBSTETRIC MORTALITY AND MORBIDITY*

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AMONG surgical procedures, cesarean section has been subjected most frequently to condemnation for its indiscriminate performance. Even a strong protagonist of this operation must admit that many of the attacks have been justified and that a regrettable number of deaths must properly be attributed to its performance under improper conditions and by faulty methods. However, in justice to the accused procedure, one should consider how much the principle of cesarean section is at fault and how much of the misfortunes following its use must be credited or better, debited, to the operator. It is astonishing with what self-confidence a physician entirely untrained in abdominal surgery will attempt a cesarean section, very often under conditions which would make its most ardent advocate hesitate.

As the result of a deep interest and rather close study for the past thirty years, I have reached the deliberate conclusion that elective cesarean section, performed by a trained obstetric specialist, carries with it no mortality other than that intangible risk which is attendant upon any intraperitoneal operation. Under such conditions the mortality of abdominal hysterotomy compares very favorably with interval appendectomy as the safest of all abdominal procedures. There is but one danger, and that is the possible rupture of the cesarean scar during subsequent pregnancies, but like the possibility of carcinoma developing in the cervical stump after supravaginal hysterectomy, this complication is far outweighed by the advantages of the operation in minimizing the dangers of childbirth in certain groups of cases.

I have previously called attention to the fact, that as a result of the continued criticism of cesarean section in the profession, there has arisen the curious condition that clinics wherein this procedure is practiced in a minimum of cases proudly advertise the fact, whereas those institutions in which the operation is frequently practiced, hang their heads and avoid all comparison of statistics. Tests of labor lasting for ninety-six hours, difficult forceps operation and version, are common in the analysis of case reports from the first type of clinic, and this naturally brings us to a second conclusion, namely, that in

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dystocia of any variety except soft tissue obstruction at the vulvar outlet, elective cesarean section under local anesthesia, will result in a marked lowering of mortality and morbidity in both mother and child.

This communication proposes to consider only truly elective cesarean sections, dealing with those cases in which there is a distinct choice between abdominal and vaginal delivery, and will not touch upon the section of necessity in absolutely contracted pelves, nor upon neglected cases when long-continued impaction or impending uterine rupture renders vaginal delivery impossible.

The cases in which purely elective section should at least be considered may be grouped as follows:

1. Borderline cases, primiparae with moderate degrees of pelvic contraction, instances of fetal disproportion from large babies, and those neurotic women of constitutional inferiority who have some diminution in the capacity of the pelvic cavity.
2. Elderly primiparae, especially where there is some small degree of pelvic contraction.
3. Central placenta previa with viable child.
4. Certain types of eclampsia.
5. Cases complicated by debilitating systemic disease, severe cardiac lesions, exophthalmic goiter, advanced tuberculosis, and so on.

It is to the first group that I beg to call attention particularly.

Careful prenatal study will segregate, from any series of pregnant women, a varying number who present definite evidences of pelvic deformity, various degrees of contraction, excessively long and beaked symphyses, heavy masculine osseous development and the like. It is a prime object of scientific obstetrics to predetermine that method of delivery in such cases as will insure a minimum mortality rate for both mother and infant as well as the greatest possible freedom from remote morbidity and continued ill-health. There are several methods of approaching this problem.

The first, that of hoping for successful vaginal delivery with abdominal hysterotomy as a last resort, needs no further discussion, as no trained obstetrician would consider such procedure.

The second, is to employ the well-known but variously defined test of labor, including from six to twelve hours of active uterine contraction, which is the rule in some clinics, or the method of Tweedy, which holds that so long as the maternal temperature and pulse rate do not exceed 100° F. or 100 beats per minute, respectively, and the fetal heart sounds do not decrease below 100, neither mother nor infant is in danger. This test of labor proving ineffective, resort is made to cesarean section.

The third plan is for the obstetrician to determine before the onset of labor whether abdominal or vaginal delivery offers the greatest

hope for an optimum result for both patients and to proceed upon that decision. This plan embraces the group of purely elective cesarean sections and is the one to which the writer is committed.

The so-called test of labor has much to commend it and bears the stamp of approval of many of the best obstetric minds of this country and Europe. It possesses, however, certain inherent faults which, in my belief, render it of little value except in a small, carefully chosen group of cases.

In the first place, no one has made a satisfactory definition of a test of labor, since the utilization either of the time factor or the severity of the uterine contractions to establish a standard, is impossible, both elements being so variable in different women. The Tweedy method of estimating the safety of mother and child by a reference to pulse rate and temperature alone, is extremely repugnant to me, as under its use strong women spend hours of useless agony before being tendered that aid which was their due. Furthermore, all too often, while one is observing a test of labor, the golden moment of election for operative interference is lost; the membranes rupture, the woman becomes suddenly exhausted, is no longer a justifiable risk for cesarean section and labor must be terminated by some form of operative vaginal delivery with more or less disastrous consequences to mother and child.

The third method of conducting labor in the presence of dystocia, that is, the predetermination of the mode of delivery and the abiding by the choice so made, if at all possible, puts the responsibility for the obstetric diagnosis and the probable outcome of the labor squarely upon the obstetrician, where it belongs. Thus we reach our third conclusion, namely, that an obstetrician, if he be competent, should be able to determine before labor but at term, in the great majority of instances, whether a woman will deliver herself spontaneously or by the aid of low forceps, or whether abdominal hysterotomy will be necessary to obviate obstruction and delay, with possible damaging high or high-mid forceps application to secure delivery.

Careful pelvic measurements made early in pregnancy and confirmed during the last month, offer a starting point in the determination as to the best method of delivery. Measurement of the fetal head by Perret's method, the fitting of head to pelvis in the last two weeks of pregnancy and finger exploration of the pelvic cavity with special reference to the length and direction of the ischial spines and the height and thickness of the symphysis, all serve to give a definite conception of the possibility of spontaneous delivery. To this should be added observation of the father, as to his general physique and especially the size and formation of his head, with an obstetric history of the patient's mother. These facts having been determined, the obstetrician should then and there decide whether reasonably easy and

safe vaginal delivery may be anticipated and if this seems not probable, he should plan and perform elective cesarean section, under local anesthesia at term, but before the onset of labor if possible.

Experience has taught me to reach a fourth conclusion, namely, that when painstaking and thoughtful examination of both the mother and her intrauterine infant has been carried out during the last months of pregnancy, the nature of the labor and the indication for its management can be correctly determined in the great majority of instances. The percentage of error will be in favor of both mother and child, since neither should suffer as the result of a perhaps unnecessary section, but one may die and the other be invalidated as the result of a vaginal delivery done under erroneous indications. And here arises the question of the secondary morbidity of difficult vaginal as opposed to abdominal deliveries. The writer is firmly convinced that the subsequent disability of the woman who has undergone a high or a high-mid forceps operation or a difficult version is very much greater than that after cesarean section. The sacro-iliac relaxation and the laceration and detachment of the deep fascial slings of the vagina, which lesions can never be adequately repaired, far exceed the dangers of peritoneal adhesions, which are perhaps the only sequelae of elective cesarean section productive of morbidity, as factors in producing long-continued ill health.

There remains to be considered the primary mortality of both mother and child as a result of the contrasting procedures which have been presented. Here again a strong personal belief must be stated, as my fifth conclusion, namely, that the primary mortality in cesarean section before rupture of the membranes, before the patient is unduly fatigued, and with adequate preoperative preparation, will be so low as to contrast favorably with any other method of delivery in similar cases, especially if the operation be performed under local infiltration with novocaine and without resort to inhalation anesthesia.

As concerns the baby, no argument need be advanced, since the high death rate of infants delivered by difficult vaginal extraction is a matter of common knowledge.

The second group, that of the elderly primipara especially those in whom there exists even minor degrees of pelvic contraction, is but a variation of the first group. Among these patients, however, there are a number in whom subsequent pregnancies are improbable, and consequently the life and health of the baby is the paramount consideration. The writer admits here a degree of radicalism which may properly be subject to criticism. Realizing the safety and ease of section, and remembering the long and stormy labors, the inertia uteri and the imperfect dilatation of the recalcitrant elderly cervix, abdominal delivery is chosen by me upon what may be somewhat flimsy indications, but patients so treated have usually at least an

uninjured baby and are themselves in good health from the obstetric standpoint, which is all that should be striven for in this somewhat restricted class of patients.

With regard to cases of placenta previa, the facts are somewhat different. In the presence of this lesion, section is indicated whenever vaginal delivery presents any difficulty, or when delay would be necessary to accomplish extraction by the vaginal route. Minor degrees of pelvic contraction in primiparae, noneffacement of the cervix, or a large child associated with central or nearly central placenta previa, are indications for celiohysterotomy. When the cervix is easily dilatable, the child of average size or smaller, and the placenta does not entirely occlude the os, vaginal delivery is probably the method of choice, although continued experience and study of mortality statistics would lead to the belief that section is indeed the most conservative method of dealing with placenta previa in most instances.

In group four, certain cases of eclampsia, I feel that elective section has a very distinct though sharply restricted field. It is my practice to always attempt treatment by conservative measures in eclampsia but to unhesitatingly perform section in those primiparae (and rarely multiparae) who show no evidence of beginning labor, who have long and uneffaced cervixes, and who grow definitely worse or at best show no improvement whatever after, say, twelve hours of conservative treatment. We have all seen patients who, coming to hospital in good general condition, rapidly fail under the most careful medical regimen, either the unmodified Stroganoff treatment or a combination of sedative and eliminative measures, which is my general plan for managing the cases. In such patients, the only hope seems to lie in a prompt termination of the pregnancy, with a minimum of trauma and since there is not time for an induced labor to be completed, section under local anesthesia seems to offer the greatest possibility for success.

It is to be clearly understood that, as stated before, section in eclampsia is suitable in only a sharply restricted group of patients, and that its general use in the treatment of this toxemia usually leads to disaster.

Severe cardiac disease, advanced tuberculosis, and other marked constitutional disturbances are being treated more and more by abdominal delivery, under local anesthesia, than by the vaginal route. The expenditure of energy on the part of the patient is so greatly reduced and the operation is so free from shock and trauma that a contrast between a woman undergoing labor, either spontaneously or by the aid of instrumental methods, with the frequent necessity for the employment of general anesthesia, is most striking and convincing.

With regard to the type of operation, I routinely employ the classical method, the incision made to the right of the umbilicus and extending one-fourth of its length above and three-fourths below this point.

The low cervical section as modified by Beck and so warmly advocated by DeLee and his followers is never used by me in the performance of elective cesarean section for several reasons. First, it is more difficult and requires more time, and it is one of my surgical convictions never to perform a complicated operation when a simple one will suffice. Second, the lack of distention and thinning of the lower uterine segment before labor, renders the extraction of the child far more difficult, and the danger of laceration of the ends of the uterine incision with sometimes obstinate hemorrhage, is an ever present one. Third, inasmuch as I do not regard peritonitis as a probable sequela of elective cesarean section, the additional protection afforded by the low operation is not needed, and last because, although it is a perfectly practicable procedure, the cervical section does not lend itself to local anesthesia with as much facility as does the simple, high incision. The preceding remarks should not be considered as a criticism of cervical section, which is an admirable procedure and a distinct contribution to the obstetric armamentarium, but I regard it as especially fitted for these cases in which labor has progressed for some time and when there is potential danger of infection.

TECHNIC OF OPERATION

To obtain the optimum results from the elective section under local anesthesia, close attention to a number of small details is absolutely necessary. The patient is admitted to the hospital twenty-four hours before the contemplated operation and is subjected to the usual laboratory tests and a careful physical investigation. A vaginal examination, with estimation of the relation between fetal and pelvic size determines the correctness or error of the previous findings. The diet is light, with an abundance of fluids. The colon is emptied by a soapsuds enema. Three hours before operation, sodium luminol is administered by mouth, the dose varying from 8 to 15 gr., depending upon the physique of the patient. At this time her relatives are excluded from the darkened room and the woman usually rapidly falls asleep. One hour before operation she is gently and quietly taken to the anesthesia or some other room adjacent to the operating room and is placed upon the operating table. A hypodermic injection of 1/6 gr. of morphine sulphate and 1/150 gr. of scopolamine hydrobromide is then given and absolute quiet maintained. At the appointed time, when all arrangements for operation have been completed, the operator and assistants scrubbed and ready, the patient, her eyes lightly covered, is wheeled into the operating room in which silence is maintained. The abdomen is gently swabbed with iodine followed by alcohol and then draped. Preoperative catheterization is not necessary. A line of incision 12 cm. long, extending from three cm. above the umbilicus to 9 cm. below it and about 2 cm. to the right of this point is then anesthetized with 1/2 per cent novocain containing 10 minims of adrenalin to the ounce of solution. The skin, fascia, muscles, and peritoneum are in turn injected, slowly and painstakingly. The abdominal parietes are then incised, sponging being by gentle, quiet pressure, no wiping or rubbing being permitted. Bleeding is controlled by clamp and ligature and the peritoneum further injected with the anesthetic solution if the patient exhibits any evidence of pain. The fundus uteri now presses upward into the incision and a suture of No. 2 chromic catgut on a medium-sized curved needle is passed through the

fascia, muscle and peritoneum at the extreme upper angle of the incision. The needle now pierces the uterine wall, a little to the right of the incision, thus correcting the normal dextroversion of that organ. Peritoneum, muscle and fascia on the opposite side of the incision are now transfixed and the sutures tied firmly, the ends left long and held by a hemostat. The same maneuver is carried out at the extreme lower angle of the incision and when both sutures are tied and the hemostats attached to them are firmly held tight by an assistant, the anterior uterine wall is seen to be in intimate contact with the spread open parietal

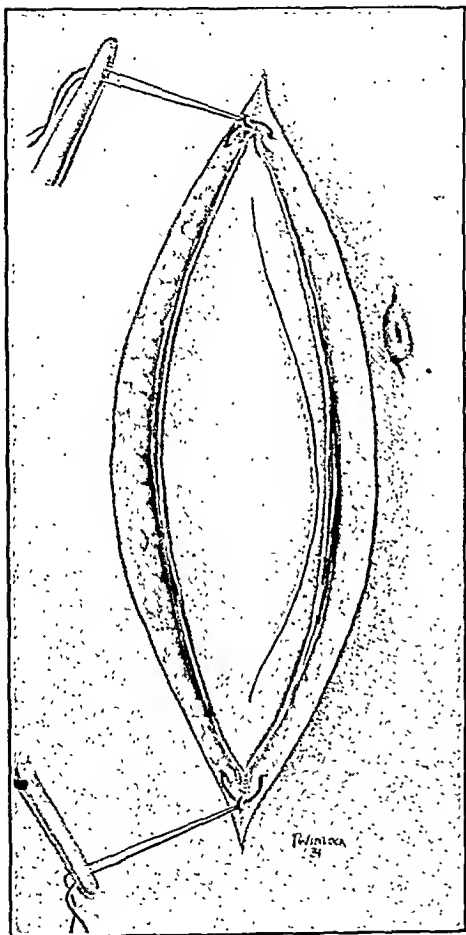


Fig. 1.

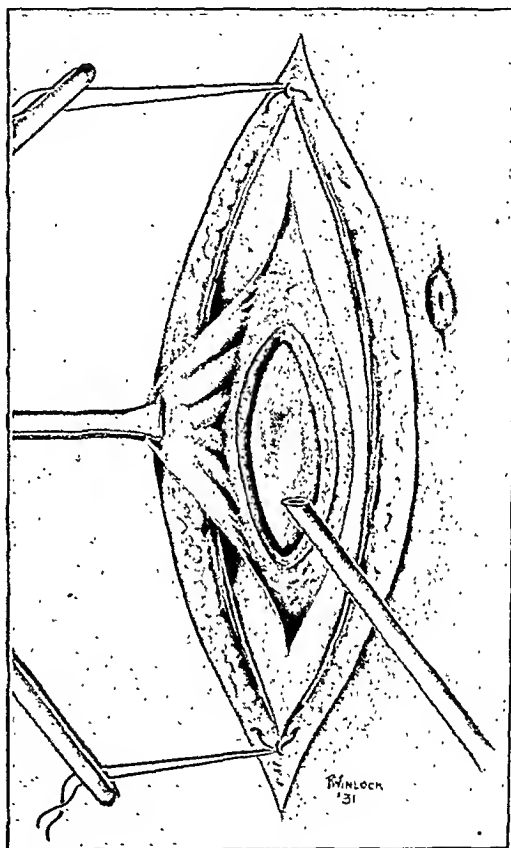


Fig. 2.

Fig. 1.—The abdominal incision showing stay sutures and the line of the proposed flap.
Fig. 2.—The flap dissected back and the uterus opened showing the pouch of membranes.

peritoneum. No further infiltration is necessary, the uterine wall being insensitive to pain.

A semilunar incision just through the uterine serosa is now made extending from one of the stay sutures to the other. The center of the flap so begun is grasped by an Allis clamp and with a few snips of the scissors the flap is dissected well back beyond the proposed line of incision in the uterine wall. The musculature under the flap is now carefully incised until a pouch of membranes bulges up into the wound. The liquor amnii is then aspirated with a trocar, the fluid draining into a basin and so preventing spill and the soiling of the drapes.

The uterine incision is then lengthened by cutting and tearing with the finger until it is approximately 11 cm. in length, and the fetus is grasped by the feet and extracted in the usual manner, except that owing to the shortness of the wound, the shoulders and head must be delivered slowly and carefully, the head being maintained in flexion by a finger inserted into the mouth.

A hypodermic injection of 1 c.c. of pituitin (obstetric) and 1 c.c. of ergot is now administered and the placenta and membranes carefully withdrawn. The uterus is closed by tier suture, an inner layer of No. 0 chromic gut, a wide middle

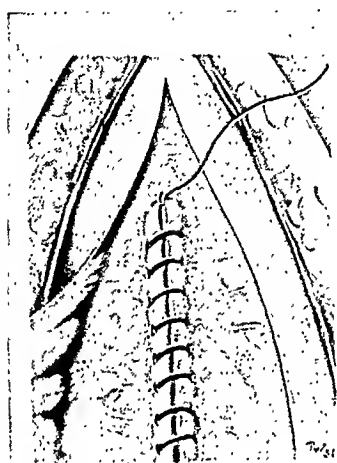


Fig. 3.

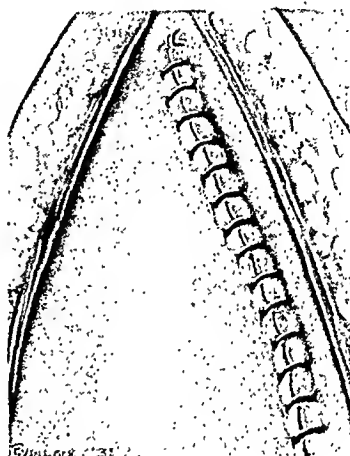


Fig. 4.

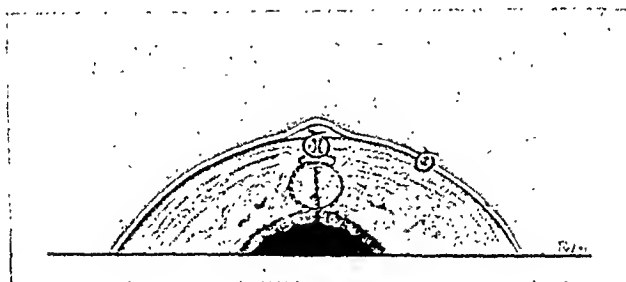


Fig. 5.

Fig. 3.—Showing closure of uterine wound.

Fig. 4.—Closure of visceral peritoneum.

Fig. 5.—Cross-section of abdominal wall showing relations of completed sutures.

layer of No. 2 chromic gut, and the flap is fastened back in place, entirely covering the uterine muscle incision by a No. 0 gut suture.

If the uterine muscle is very thick, or if bleeding is troublesome, mattress sutures of catgut may be required. At no time during the operation is the uterus everted, and the stay sutures are always held taut. No packing or walling off is necessary nor is the abdominal cavity sponged at any time. The stay sutures are now cut away, the uterus sinks into the abdomen, and the abdominal incision is closed by tier suture, an intracutaneous skin stitch, or skin clips being utilized. A firm occlusive dressing of adhesive plaster is applied to complete the procedure.

Patients so treated usually take light diet on the evening of the operation and are subsequently managed as ordinary puerpera, out of bed on the tenth day and discharged on the fourteenth. Two minor points should never be neglected. If the operation has consumed some time, it will probably be necessary to reinfiltrate the parietal peritoneum and the skin with novocain to prevent a painful closure. Second, the moment it is observed that the patient does not respond well to local anesthesia and begins to complain or to move, this method should be abandoned at once and nitrous oxide inhalation be commenced. An anesthetist, with gas apparatus should always be in attendance for this purpose. It is infinitely better surgery to admit the failure of local anesthesia early, than to prolong its use in a suffering, complaining patient.

1814 SPRUCE STREET.

ADDITIONAL REPORTS ON THE SATCHEL HANDLE OPERATION FOR ARTIFICIAL VAGINA

("THE FORMATION OF AN ARTIFICIAL VAGINA BY A NEW
PLASTIC TECHNIC")

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IN THE December, 1927, issue of the AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY, we described a new technic for the formation of an artificial vagina by means of tube flaps.¹ In the intervening time we have had the opportunity of operating upon three other patients for absence of vagina, in two of whom the original technic was employed. In the third an attempt was made to shorten the procedures but, as will appear from the history, the result was not as satisfactory. Dr. Stephen Rushmore, in a private communication, informed me (November, 1928) that the method had proved very satisfactory when using two tube flaps and that at no time was there any evidence of defective circulation in either flap. He reported that the immediate result was satisfactory. The present article deals with the follow-up of our original case and the description of additional cases.

CASE 1.—(Upon which our first report was based) A. Z., was operated upon on February 26, 1926. Physical examination showed a typically feminine individual, twenty-six years of age, married but divorced. The vagina was represented by a blind inelastic sac which could be indented for 1.5 cm. This canal was the result of a previous attempt at making a vagina at some other hospital. The full details of the operation we performed were given in our original communication. The patient remarried shortly after the artificial vagina was completed and has lived happily with her husband who, we gather, is unaware of her condition. She was last examined on March 25, 1931, at which time the vagina was found to be long, roomy, admitting a full size speculum. Most of the flap appeared intermediate in type, between mucosa and skin, the lower portion of the posterior flap still showing distinct evidence of its cutaneous origin.

CASE 2.—J. K., aged twenty-one, married, about to be divorced by husband because of impotentia coeundi. Admitted October 13, 1927. Physical examination showed a rather obese feminine individual with normal vulva, the vagina being represented by a very short blind vestibular pouch. In addition this patient showed polydactylism. Examination of the blood for the presence of female sex hormone demonstrated functioning ovaries.² By rectal examination no palpatory evidence of internal genitalia was demonstrable.

On October 14, 1927 the first stage was performed, a long skin tube ("satchel-handle") flap being fashioned from the inner side of the left thigh. On November 21 the flap was incised so as to liberate the distal pedicle. On November 28 the final stage of the operation was undertaken, the distal end of the flap being entirely severed, the tube reopened and implanted in a canal prepared at this time by

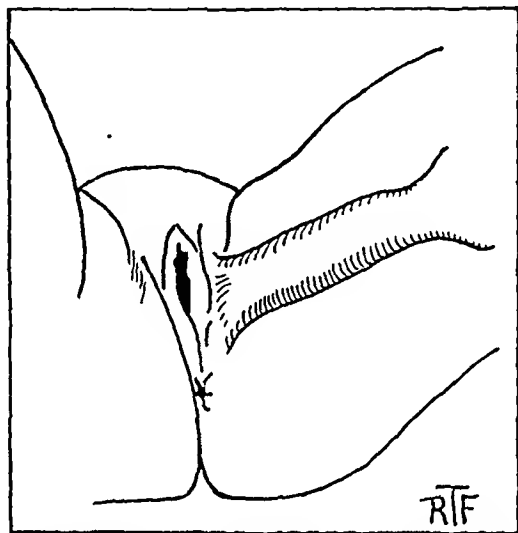


Fig. 1.—Healed tube flap from left thigh. Ready for severing distal pedicle and re-opening the tube for implantation.

separating the tissues between bladder and rectum. Fifteen days later the rubber plug was removed. On discharge, December 16, 1927, the vagina was found roomy and covered with viable epithelium. This patient was seen one year later, happily married, the vagina roomy and functioning. No further follow-up has been possible.

CASE 3.—R. L., aged twenty, single, in every way feminine and with strong sex urge. She was admitted to the hospital on October 13, 1928. The vulva was found normal. The blind vestibular pouch could be indented only 1 cm. No internal genitalia could be felt by rectal examination. A typical "satchel-handle" flap was fashioned on the left thigh on October 18, 1928.

This patient, like the first one, developed pyelitis, due to the indwelling catheter. The final stage of the operation at which the distal end of the flap was cut across, the tube reopened and implanted in a canal fashioned between the bladder and rectum, was performed on December 17, 1928. This patient was last seen in October, 1930. She was still single and had not indulged in coitus. The introitus was normal, the vagina admitted two fingers for $1\frac{1}{2}$ inches. At this point a stricture had developed which was readily dilated as it was largely due to agglutination of opposing epithelial layers, and beyond this the vagina extended for another inch. This patient was instructed to occasionally pass a vaginal plug.

The following is the description of the operation in which we deviated from our original technic.

CASE 4.—E. S., aged twenty-two, was seen May 2, 1927. Face and general appearance were attractively feminine, but the hips were rather narrow. The vulva was normal. There was a slight dimple in the region of the fourchette which could not be indented. Per rectum a transverse band was felt high up in the pelvis and far out on the left side a gonad (?) could be felt. At the age of twelve a laparotomy had been performed on this patient, but we were informed that no biopsy on the sex gland had been done, and consequently the sex of the patient was as yet undetermined. However, examination of her blood, continued over a long period, showed cyclical accumulation of female sex hormone,² which we interpret as definite evidence of the presence of functioning ovaries. We essayed to shorten the time required for the construction of an artificial vagina by making club shaped skin flaps, the base of which reached to the labium majus, 5 inches by 2½ inches, fastening these to a Ferguson speculum by means of sutures, and at once implanting them in the new formed canal prepared between the bladder and rectum. The flaps were introduced without tension and a considerable portion of the flaps healed in. Neither their base nor the epithelial covering however showed the resistance so plainly manifested by the tube flaps used in the other cases. In consequence of this vulnerability, areas were constantly breaking down, and, due to retraction, the apex of the artificial vagina became denuded and covered with granulations. Repeated skin grafts, both Thiersch and Wolf, were implanted over a period of more than a year and for a long time this vagina showed a tendency to shrink. However, treatment continued throughout the second year after the primary operation resulted in the formation of a satisfactory vagina. This patient is now happily married for nearly a year.

It has seemed to us worth while to again report the excellent and permanent results of the tube flap technic which enables the formation of a permanent, functioning artificial vagina by a procedure unattended by serious risk. Evidence that the tubulation endows the subcutaneous tissue and epithelium utilized for the formation of an artificial vagina with great resistance to trauma and interference with the blood supply is afforded by the difference in course between the cases operated upon by means of tube flap and the solitary case in which direct flap introduction was attempted. The only technics which can be considered in competition with the tube flap technic are the utilization of an intestinal loop (technic of Baldwin²) or the transplantation of the lower segment of the rectum (technic of Schubert³) both of which require transection of the intestine with its attendant dangers.

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REFERRED PAIN OF URETERAL ORIGIN*

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THE interesting phenomena of referred pains have always been both helps and hazards to differential diagnosis. Not so widely recognized as the distant pain of angina pectoris and gall bladder disease are those initiated by ureteral pathology, notwithstanding the early observations of Dietl and the later insistence of Hunner. We accept without question, however, the spectacular Dietl's crisis; we are skeptical of or utterly oblivious to the milder distress signals of the ureter.

My own still unsatisfied curiosity about the ureter was aroused five years ago by a patient in the Gynecologic Dispensary of the Woman's College Hospital.

Mrs. E. S., aged thirty-six years, came complaining of pain in the lower right quadrant, right lumbar backache, attacks of mucous diarrhea, and sciatica. When the "sciatica" was at its worst, the pain shot down to her right heel. Her only urinary symptom, occasional painless frequency, had not impressed her as a complaint. The onset of her symptoms followed a forceps delivery fourteen years before. In an effort to get well, she had submitted to three laparotomies. Her appendix first, then her gall bladder, and finally her right tube and ovary had been removed. In the meantime she had lost several teeth to clear up the sciatica, and was wearing corrective shoes for the pain in her heel. She had spent her substance on specialists, and had descended to our clinic unrelieved.

On vaginal examination, a thickened tender right pelvic ureter was felt, pressure upon which reproduced the right groin pain, shooting to the right lumbar region and down the back of the thigh. Cystoscopy showed a bladder normal except for a very small rigid right ureteral meatus, which admitted a No. 5 catheter with difficulty. The passage of the catheter through the first 3 cm. produced first the local pain, then the "sciatica," and then to our amazement, the pain in her heel. She had 14 c.c. residual urine in her kidney pelvis, and the injection of 15 c.c. of 0.5 per cent silver nitrate solution into the ureter reproduced the right lumbar pain with nausea, and precipitated an attack of diarrhea.

So pyrotechnic a display of symptoms apparently arising from irritation of the ureter demanded an explanation. A search of the literature at that time was disappointing, except for frequent references in Hunner's articles to "the leg pain of ureteral stricture," and chronic indigestion from the same cause. Even Hunner, however, did not pause to explain his observations.

The frequency of this disturbance must be evident from a study of 1,164 urologic cases made in the dispensaries of the College and Woman's Hospitals and in private practice in the past five years, in which an incidence of 471 proved cases of referred ureteral pain was noted.

*Read at a meeting of the Philadelphia Obstetrical Society, May 7, 1931.

Following are brief reviews of typical cases:

Mrs. E. H. (27196), College Hospital. Chief complaint: nervous indigestion, for which she had been treated in several clinics, and given bromides until she was covered with the rash. Location of pain, near McBurney's point. Referred to the right lumbar region and down the outer anterior thigh. In making the pyelogram we overdistended the ureter slightly, causing her pain with its references, and the nauseating quiver in her epigastrium for which she had taken the bromides. All the symptoms were exaggerated in the upright position. Diagnosis: right renal ptosis. Treatment: the patient was fitted with a belt and referred to the Family Society for more food. Result: ten pounds' gain in the first month, with disappearance of all symptoms.

Mrs. H. H. (B. 1568), Woman's Hospital. Complaint: pain in the right side, right backache, frequency of micturition, pain down the inner anterior thigh, with attacks of nausea and vomiting when the pain was worst. No bladder inflammation. No obstruction to the passage of the catheter, but reproduction of the pain by filling the kidney pelvis, with nausea in the upright position. Urogram showed ptosis. A belt had given her much relief.

A. R. (9867), College Hospital. Sent in for appendectomy. Referred to Urological Clinic by an alert interne because of transmission of her pain from McBurney's point down the inner and anterior surface of her thigh, and a history of frequency of micturition. Urogram shows ptosis with rotation and beginning hydronephrosis. Treatment: appendectomy. Pathologic report: chronic obliterative appendicitis. Result: relief while in bed. Returned to clinic one month after operation with all her old symptoms.

Mrs. A. B. (A5+156), Woman's Hospital. First seen with acute pyelitis of pregnancy. Frequent recurrent attacks. Pain located in the right costovertebral angle, referred around the crest of the ilium, down the outer anterior thigh, epigastric discomfort, flatulence, constipation. The pyelographic procedure reproduced her symptoms, and the plate shows her lesion: ptosis with a kink of the middle ureter. She has had no trouble since wearing a belt and gaining some weight.

Mrs. C. C. (A62831), Woman's Hospital. Complaint: pain in the lower left side, dyspareunia, pain down the back of the left thigh, left lumbar backache, and slight nausea. Rolling a tender cord-like ureter under the finger reproduced the discomfort of intercourse, and sent a pain down the back of the thigh. Cystoscopy showed a stricture of the left vesical ureter and the urogram a mild left renal ptosis. She has been entirely relieved by dilatation of her stricture.

Mrs. E. O. (B3791), Woman's Hospital. Complaint: pain in both sides, both lumbar regions, the front of the left thigh and the back of the right. Findings: bilateral ptosis, with additional stricture of the right vesical ureter. She is improving under treatment.

E. S. (B3615), Woman's Hospital. Complaint: pain in both groins, both lumbar regions, down the back of both thighs, with chills and fever. Cystoscopy showed bilateral pin-point ureteral meatuses, admitting at first only No. 4 bougies. Dilatation was kept up until No. 9 bougies passed easily. This urogram was made after the attack subsided, showing dilatation of both pelves and ureters. Recently she returned in another attack for which we blame stasis in her atonic ureters. This time she had only the lumbar pain, and pituitrin has reduced her fever. We have stood by her bed after a hypodermic, watching the pituitrin whip her ureters into activity, as manifested by local and anterior thigh pain.

Two more cases, both in young girls with the lateral dysmenorrhea of strictured vesical ureters. F. F. had pain in the right side and down the back of the right thigh, with vesical irritability before menstruation, but no pyuria. She has been

permanently relieved by dilatation of her lower right ureter. J. B. had a similar condition on the left with a similar result.

That the reverse of the picture is true, and the absence of these pains may be as significant as their presence, is illustrated by the last case, J. W. (10323), College Hospital. Cystoscopy showed golf-hole ureteral meatuses, with vesicorenal reflux. The uroselectan plate confirmed the findings. Although she had bilateral infected hydronephrosis with a marked constriction of her right ureter, she had no pain. Her atonic ureters had ceased to protest.

SUMMARY AND CONCLUSIONS

1. Study of the nerve supply of the ureter shows theoretically that pathology of the upper ureter may manifest itself by gastrointestinal disturbances, and also by pain felt in the surfaces supplied by the intercostal and lateral cutaneous nerves; that the middle ureter may cause pain in the distribution of the lumbar nerves, over the vulva and the front of the thigh; and that the pelvic ureter may produce sciatic pain.

2. The proof that these pains are of ureteral origin has been obtained by reproducing them with the manipulation of the ureter, and by relieving them when it was possible to cure the suspected pathology.

3. The incidence of this referred pain of ureteral origin is 40 per cent of all our recent urologic cases.

4. We wish to emphasize the fact that comparatively so few of these patients presented obvious urinary symptoms as their chief complaint; that so few of them, even with vesical irritability, showed either pyuria or fresh inflammation of the bladder or urethra. The key to their causative lesions was the interpretation of their pain. Hence we believe that awareness of the repercussions of ureteral pathology as manifested by referred pain will elucidate many a cloudy diagnosis and obviate much medical and surgical therapy which has proved, for the patient, at least, beside the point.

REPORT OF A CASE OF OVARIAN PREGNANCY WITH COMMENTS ON ITS ETIOLOGY*

BY ANTHONY WOLLNER, M.D., F.A.C.S., NEW YORK CITY

THE possibility of ovarian pregnancy has long been a controversial subject. Since the publication of C. van Tussenbroeck's classical case of ovarian pregnancy in 1899, many other reports have appeared in medical literature, indicating beyond doubt that true ovarian pregnancy occurs and has a place in gynecologic pathology. It is difficult to estimate correctly the total number of authentic cases among those published. Reviewing a total of 87 cases in the literature, not more than 48 of them can be definitely classified as true ovarian pregnancies. The other 39 are questionable, because they either fail to comply with the requirements necessary to establish the diagnosis of ovarian pregnancy, or they do not include convincing microscopic data.

The following case is reported because of certain unique features in the clinical history:

The patient was thirty-five years of age. She had a normal delivery at the age of nineteen, and did not conceive for sixteen years after that. Menstrual history: twenty-six-day type, very scanty flow, two days' duration, accompanied by severe headaches, without abdominal pain. In April, 1930 menstruation was delayed for ten days. She then went to a midwife, who performed a curettage. Following the curettage, the patient bled for three weeks continuously, but did not have any abdominal pain. In June she became suddenly ill and experienced sharp pains in the right lower abdominal quadrant. Her doctor sent her to a hospital with a diagnosis of ovarian abscess. She remained in the hospital for two weeks on conservative treatment, consisting chiefly of ice bag applications to the abdomen. Her hospitalization was complicated by severe tonsillitis with moderate elevation of temperature. She was discharged from the hospital somewhat improved, but with persistent pain in the right lower quadrant.

I first saw the patient three weeks after she left the hospital. Her temperature was then normal, pulse 92 and she appeared to be markedly anemic. There was moderate tenderness over the right lower abdomen. Vaginal examination revealed a scanty bloody discharge. The uterus was somewhat enlarged, not particularly soft, and displaced to the left, in ante flexion. The right side was moderately sensitive and contained a fluctuant mass, the size of a fist. The left adnexa were negative.

The clinical history and the finding of a unilateral adnexal tumor aroused the suspicion of an ectopic pregnancy and operation seemed indicated. Under ether anesthesia a mid-line incision was made. The omentum was found drawn down and attached to the right adnexa, but was easily freed and the right adnexa brought into view. The fallopian tube was about 8 cm. long, somewhat thickened and continuous with a large, round tumor measuring 7 by 9 cm. The tube could be traced distinctly on the upper edge of the tumor, and its fimbriae were spread

*Read before the Section of Obstetrics and Gynecology of the New York Academy of Medicine, February 24, 1931.

out over its lateral surface. The tumor occupied the site of the right ovary and was attached to the uterus by the ovarian ligament. A long, thickened appendix was found adherent to the posterior surface of the tumor. The mass had a brownish color and was fluctuant. In attempting to deliver the tumor into the abdominal wound, it ruptured at the point where the appendix was adherent to it, and a small blood clot appeared in the opening. The right adnexa were removed by clamping, cutting and ligating the infundibulo-pelvic ligament, the mesosalpinx, and the proximal end of the tube. The uterus and left adnexa were found to be normal. The inflamed appendix was removed in the usual manner.

Recovery was uneventful and the patient left the hospital twelve days after the operation.

Macroscopic inspection of the extirpated tumor suggested that the preoperative diagnosis was incorrect, as it closely simulated a chocolate cyst or endometrioma of the ovary. But when the tumor was incised, an irregularly shaped sac was found in the central portion and this was lined with a glistening membrane. The sac itself was



Fig. 1.—A photograph of the gross specimen. The irregularly shaped sac may be seen in the central portion of the tumor. On the right side, the lining membrane is partly detached. In the right upper corner the stump of the uteroovarian ligament can be identified.

filled with fresh blood, and the membrane could easily be detached from the surrounding tissue.

The criteria of ovarian pregnancy as formulated by Spiegelberg and Werth are: (1) The tube on the side of the pregnancy must be intact; (2) the fetal sac must occupy the position of the ovary; (3) the ovary must be connected with the uterus by the uteroovarian ligament; and (4) definite ovarian tissue must be found in the wall of the sac. As this specimen complied with all these requirements, further steps were taken to justify the diagnosis. Several blocks were taken from the tissues adjacent to the fetal sac, and these sections showed the sac to be entirely surrounded by ovarian stroma. Practically the entire specimen was dissected and several follicle cysts were found in the stroma. There was no trace of a corpus luteum.

Two types of ovarian pregnancy are recognized: (1) the intra-follicular type and (2) the superficial type: or as Sutton classifies them the primary and secondary type. The primary type is one in

which the fertilized ovum undergoes its development entirely within the ovary: the secondary is one in which the ovum, following its fertilization, undergoes a certain stage of its development in some nearby structure or cavity, usually the fallopian tube, and then becomes implanted in the ovary. I believe that Sutton's classification is correct, because the ovary has only one structure which is adapted to the nidation of the fertilized ovum, this being the epithelial lined cavity of the graafian follicle. Hence, only the intrafollicular type can be considered as a true ovarian pregnancy, since the superficial type is most likely the result of a secondary nidation.

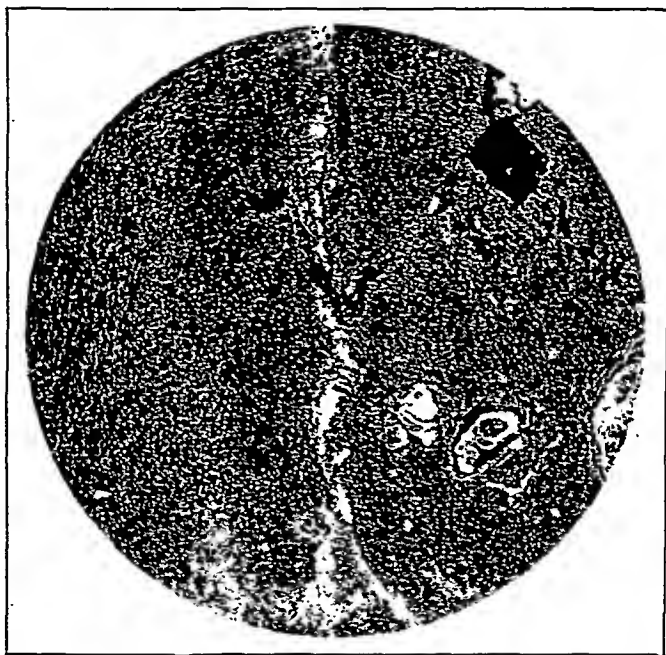


Fig. 2.—A photomicrograph of a section taken from the tissue surrounding the sac. The ovarian stroma is visible on the left side. Several chorionic villi can be seen to the right and below.

The microscopic study of the specimen taken from my patient demonstrated the primary type of ovarian pregnancy.

The macroscopic diagnosis of ovarian pregnancy, especially that of the intrafollicular type, is extremely difficult because, (1) this type of ovarian pregnancy has little tendency to rupture, (2) because the tumor closely resembles a chocolate cyst. In cases of intrafollicular conception, the spermatozoon enters the ruptured follicle, fertilizes the ovum within the follicle, and following this, the site of the rupture closes and the fertilized ovum continues its development. The intrafollicular continuance of the pregnancy stimulates the connective tissue of the ovary and shortly thereafter the ovum becomes surrounded by ovarian tissue. After the ovum reaches a certain developmental stage, it usually dies because of extensive bleeding in the

wall of the fetal sac and chorion frondosum, resulting in the formation of a blood mole within the ovary. This sequel of an intrafollicular pregnancy explains the rarity of a ruptured true ovarian pregnancy. On the other hand, an unruptured ovarian pregnancy presents the same appearance and characteristics as the so-called chocolate cyst. A differential diagnosis is only possible by a thorough microscopic study of the specimen.

I believe that ovarian pregnancy is not as rare as the comparatively small number of reported cases would indicate, but that, due to its simulation of a chocolate cyst and also to the lack of thorough micro-



Fig. 3.—A photomicrograph of the chorionic villi under high power.

scopic examination of these tumors, a good many cases are unrecognized.

The etiology of ovarian pregnancy has not been satisfactorily explained as yet. In these cases there is a pathologic alteration of the ovulation processes. For some reason the ovum does not leave the follicle after the rupture has taken place, and this is accounted for in two ways. One theory postulates that the occlusion of the rupture by a small blood clot makes the expulsion of the ovum impossible. This idea is unsatisfactory, because such an occlusion would also preclude the entrance of the spermatozoon into the follicle. The second theory assumes that if the ovum in the ripening graafian follicle is dislocated, so that it does not get into the stream of the escaping liquor, it may be retained in the follicle. This explanation is also improbable, first, because the clinical features of an ovarian pregnancy do not comply with such a supposition, and secondly, because microscopic

studies of the ovulation, made in an extensive series of cases by Strassmann, do not demonstrate such pathologic condition within the follicle.

To study pathologic ovulation is extremely difficult, as only those cases which eventuate in an ovarian pregnancy come under observation. There is reason to believe however, that the pathology of ovulation is not of rare occurrence. Considering the difficulties which a spermatozoon encounters passing through the uterine cavity and tube it is safe to assume that it arrives at the ovary with a greatly impaired vitality. It is also probable that only in a small number of the cases can the spermatozoon fertilize the ovum within the follicle, and that there is a much larger percentage of pathologic ovulation, which because they do not result in ovarian pregnancies and because of the absence of annoying clinical symptoms, pass unrecognized.

One point in the clinical histories of reported cases of ovarian pregnancy may afford a clue to the etiology. This important factor is the long-standing sterility previous to ovarian pregnancy. Sutton and Bass report cases in which the patients were never pregnant prior to the ovarian pregnancy, although married for six or seven years. In my case the ovarian pregnancy was preceded by sixteen years of barrenness. Liebe reports a similar period of twelve years. These long periods of sterility cannot be considered as mere coincidences, but demonstrate that the pathology was not confined to a single graafian follicle, and that the whole ovary was involved. This led to pathologic ovulations in each of the graafian follicles. The pathology consists of a changed mechanism of ovulation: the follicles do not discharge the ovum, the ovum remains within the follicle, and perishes there, except in these rare cases in which fertilization takes place within the follicle.

It is therefore logical in seeking the etiology of ovarian pregnancies, to discover first the nature and causes of the pathology that bring about the retention of the ovum in each graafian follicle.

A reasonable conception of this is the following. In the process of physiologic ovulation, after rupture has taken place, a certain amount of force is required to free the ovum from its attachment to the cumulus oophorus cells and to expel it from within the follicle. The power of this force depends on two factors. The first is the intra-follicular pressure, and the second is the resistance of the surrounding tissue. The resistance of the surrounding tissue is dependent upon the thickness and special structure of the membranous wall. Any pathologic alteration that involves the tunica albuginea is likely to produce an increased resistance of the follicle wall. One can imagine that such changes in the superficial layer of the ovary affect the physiologic mechanism of the ovulation. In normal cases the sudden change in the tension of the follicle supplies the force which is required to liberate the ovum. When, however, the follicle wall's resistance is in-

creased, the extent of the rupture will be much smaller and the liquor will not escape with a sudden gush, but will dribble away slowly, thus not having sufficient momentum to free the ovum and flush it into the abdominal cavity. This pathologic mechanism might be called the slow-rupture of the follicle, which is intermediate between nonrupture and physiologic rupture of the follicle. I think, therefore, that the nature of the pathology, which causes the ovum's persistence within the follicle, must be sought in a structural change of the ovarian surface, such as is found in cases of chronic oophoritis.

That the thickening of the tunica albuginea must play a part in etiology of ovarian pregnancies is evidenced by certain microscopic findings. Observers who made a careful microscopic study of their specimens found that those portions of the tumor, which showed intact ovarian stroma, were richly filled with follicle cysts of various sizes. My microscopic slides confirm these findings. The follicle cysts are nonruptured graafian follicles, which could not rupture because they met too much resistance of the tunica albuginea. Occasionally the ripening follicle may reach the ovarian surface on an area which offers comparatively less resistance, so that it does rupture but with a changed mechanism, as previously explained.

Summing up the deductions derived from the clinical and histologic features of ovarian pregnancy, it may be said, that the pathology is not confined to a single graafian follicle, but involves the whole ovary. Structural changes of the ovarian surface bring about greater resistance of the follicle wall, and this leads to nonrupture, or to a small rupture with a slow dribbling away of the liquor folliculi, which we call slow-rupture. The ovum therefore is not subjected to the required force, which can free it from its attachments and expel it into the abdominal cavity. The ovum remaining in the follicle, the patient becomes sterile, unless under the influence of favorable circumstances the ovum becomes fertilized within the follicle.

I believe that this theory explains the clinical and histologic features of ovarian pregnancies, and hope that further investigations of chronic oophoritis will provide more definite data and prove the correctness of this viewpoint.

CONCLUSIONS

1. The macro- and microscopic examination of my specimen proves it to be a true ovarian pregnancy.
2. I believe, that due to the tumor's great resemblance to a chocolate cyst and because of the lack of sufficient microscopic examinations, a great many similar cases of ovarian pregnancy are overlooked.
3. The etiology of ovarian pregnancy is predicated upon a pathologic ovulation of the graafian follicles, and this probably is caused by structural changes in the ovarian surface.

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1015 LEXINGTON AVENUE.

CARCINOMA OF THE BARTHOLIN GLAND

BY JACOB RABINOVITCH, B.Sc., M.D., C.M., ST. LOUIS, MO.

(From the Department of Pathology of the Missouri Baptist Hospital and Washington University School of Medicine)

PRIMARY carcinoma of the Bartholin gland is a very rare occurrence. The total number of cases reported in the literature to date is probably not more than forty. However, much of the common impression that malignant tumors of the Bartholin gland are relatively rare might be due in part at least to the high percentage of error of diagnosis. Schwcizer¹ in 1893, described a tumor located in the right labium majus in the case of a fifty-year-old woman; this tumor was erroneously diagnosed as an inflamed Bartholin gland. The tumor was exsised but it recurred three years after removal and at this time it was found to infiltrate the pubic bone. On microscopic examination the tumor consisted essentially of nests of cells enclosed in a connective tissue network. The tumor cells were small, epithelioid and polyhedral in structure and contained a relatively large hyperchromatic nucleus. In 1904 Frisch² described a tumor of the Bartholin gland which histologically had a papillary pattern; the epithelium lining the papillae was several layers thick and the nuclei were small, hyperchromatic and situated at the base of the cells. Some of these cells assumed the character of goblet cells. In certain areas of the tumor there were also found solitary cysts lined with epithelial cells that closely resembled those of the normal Bartholin gland. Normal glandular structure was entirely absent however in this tumor. Since the publication of these cases other instances of similar tumors were reported, and in 1923, Falls,³ and in 1930 Schneider,⁴ each presented a fairly inclusive bibliography and summary of the literature up to that date and also added a case of his own.

The object of this paper is to summarize the principal observations in a pathologic study of a case of carcinoma of the Bartholin gland

which has been observed at the Missouri Baptist Hospital, and to present for convenience of reference a summary covering the subject.

CASE REPORT

The patient, M. S., a white female, aged seventy-one years entered the Missouri Baptist Hospital on August 27, 1930, complaining of swelling of the right labium majus. She had had no previous serious illnesses excepting for a right inguinal hernia for which she was operated upon forty years ago. There had been no vaginal discharge. She complained of frequency of urination and nocturia but no dysuria of any kind. She had been somewhat constipated and subject to frequent colds.

The present illness began three years ago when the patient first noted a painless swollen mass in the right labium majus, which gradually increased in size and be-

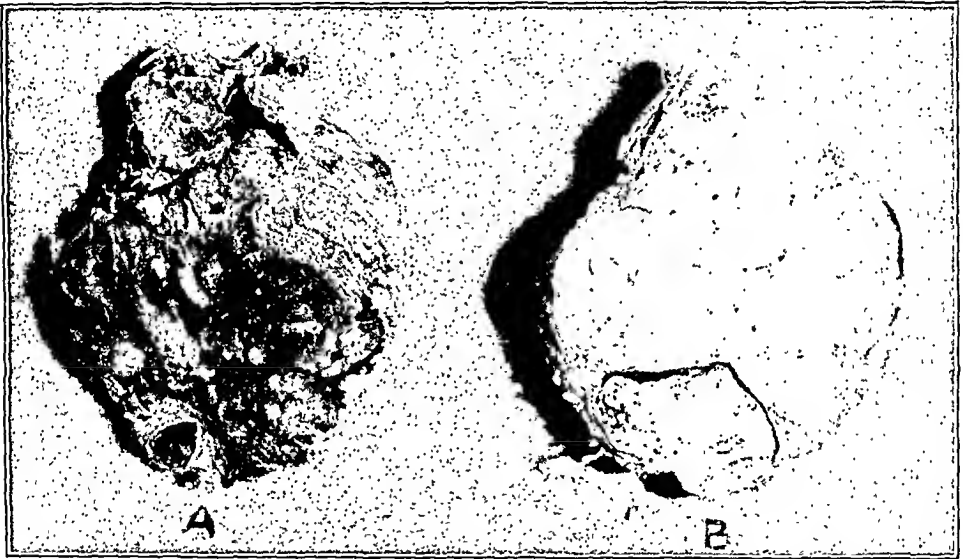


Fig. 1.—Photograph of the gross appearance of the tumor of the Bartholin gland. A shows the external capsular surface of the tumor and B, the cut surface.

came painful. As time passed on the pain became more severe in character and also more constant. At no time was there any discharge coming from this swollen mass. Because of the steady increase in the size of the tumor and the constant pain that was associated with it the patient entered the hospital seeking relief from the above symptoms; her health otherwise was unimpaired.

Physical Findings.—The patient was a fairly well-developed and well-nourished white female of about seventy years old.

A mass occupying the lower two-thirds of the right labium majus, bulged over the introitus and almost obliterated the vagina. It also extended inward along the anterior surface of the lower rectal wall for a distance of about two inches from the anal orifice. The mass was irregular and nodular in outline and mostly firm in consistency. Certain portions, however, were softer than others and showed definite fluctuation. The skin overlying this swollen mass was reddened, the redness was also apparent over the proximal portion of the thigh. There was no ulceration of the surface. The tumor was quite tender to the touch and it was not firmly attached to the skin anteriorly or to the rectum posteriorly. The cervix and uterus were

normal; the adnexa were not palpable. The inguinal lymph nodes were not markedly enlarged.

A preoperative diagnosis of a possible abscess of the Bartholin gland was made. Operation was performed on August 30, 1930. An incision was made over the right labium majus and a tumor the size of an orange was readily delivered. The wound was then closed and an uneventful recovery followed.

Pathologic Examination.—The tumor was spheroidal in shape measuring $8.5 \times 7 \times 3.5$ cm. The surface was irregular and nodular in outline but the tumor appeared well encapsulated and very firm in consistency. (Fig. 1.) Cut section of the tumor disclosed a greyish white surface upon which fine interlacing bands of connective tissue could be seen separating the parenchymatous tissue into irregular lobules. There was no gross evidence of any necrosis in the tumor although certain portions appeared slightly cystic and hemorrhagic.

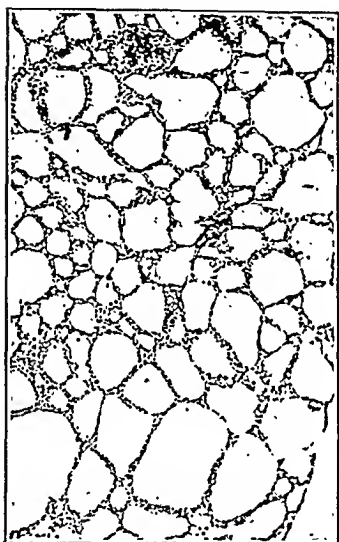


Fig. 2.



Fig. 3.

Fig. 2.—Low power photomicrograph of the tumor showing its acinar structure and its resemblance to thyroid tissue. There is very little connective tissue stroma present in the tumor.

Fig. 3.—High power photomicrograph of the tumor showing again its acinar structure and tendency to lobulation.

Microscopic Examination.—Microscopically, the tumor consisted of masses of epithelial tissue of various size separated from each other by thin bands of connective tissue. A cursory examination of the tumor with the lower power ocular disclosed a very striking resemblance of the tumor to malignant thyroid tissue in so far as the architectural arrangement of the acini and the lining epithelium was concerned. (Figs. 2 and 3.) However, a careful examination particularly with the high power ocular revealed the true histologic nature of the neoplasm. The tumor as a whole was very cellular and contained only a strikingly small amount of fibrous tissue stroma. Necrosis was entirely absent, and although the growth was regarded as carcinomatous in structure, the cells did not penetrate far into the deeper tissues. The greater bulk of the individual nodules was composed of acini lined mostly with only one layer of cuboidal epithelium. The cells were charac-

terized by a cylindric shape, a small amount of cytoplasm, a large amount of nuclear material which took the shape of the cell and stained intensely. The acini varied in size, some were very small while others assumed considerably larger dimensions and gave the impression of little cyst formation. The lining epithelium of the larger dilated acini was very low and in places flattened out acquiring there



Fig. 4.—Infiltration of cancer cells into the capsule that surrounded the tumor. The capsule consisted of a dense layer of fibrous tissue.

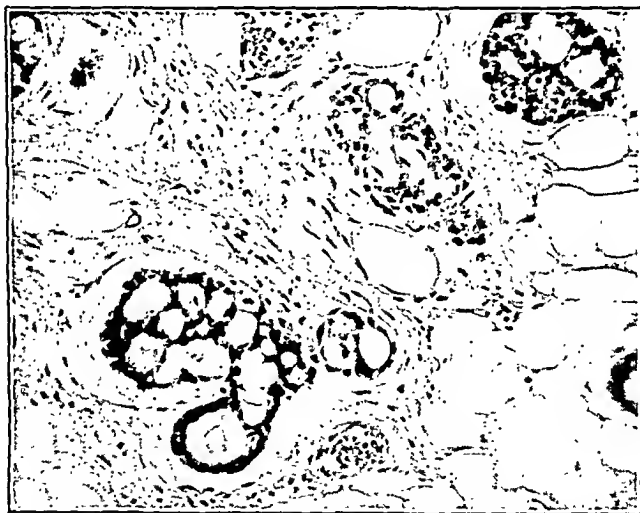


Fig. 5.—Diffuse infiltration of the lymph spaces with tumor tissue.

an almost linear dimension. The lumen formed by most of the acini was clear; others, however, were filled with either pink stained fluid or desquamated epithelial cells. It was the latter type of acini seen under the low power ocular that suggested a resemblance to thyroid tissue. In other parts of the section the cells were aggregated into solid nests losing thereby their acinar structure and presented no definite histologic pattern. Mitotic figures were rather infrequent. The blood

vessels were not prominent and relatively few in number. In the capsule surrounding the tumor there were found scattered areas of tumor tissue. Some of the latter were found to invade the lymph spaces. (Figs. 4 and 5.)

In summarizing the salient points of this tumor particular emphasis must be laid on its definite encapsulated form, its large size and its origin from the acinar portion of the Bartholin gland. The striking similarity of the tumor to malignant thyroid tissue should also be mentioned. A lack of appreciation of the normal anatomic and histologic characteristics of the gland may therefore lead to erroneous conclusions as to the true origin of the growth. However, by exercising special care in a complete study of the various sections, a correct diagnosis can readily be made.

DISCUSSION

Correct early diagnosis of malignant tumors of the Bartholin gland are made probably less frequently than of malignant tumors involving any other organ of the body. Carcinomas arising however from the Bartholin gland possess a distinct and characteristic structure which can readily be recognized and differentiated from that of tumors arising from other glandular organs. The normal histology of the Bartholin gland is that of a compound acinous structure. The acini are lined with either cuboidal or columnar epithelium while the ducts are lined with squamous epithelium. It becomes obvious therefore that two histologically different types of carcinoma may occur in the Bartholin gland, namely, (1) a columnar and (2) a squamous cell carcinoma. According to Sitzenfrey⁵ also, the normal transitional and columnar epithelium which lines the deeper portions of the ducts may be replaced by squamous epithelium in the presence of a chronic gonorrheal infection. Under such circumstances a squamous cell carcinoma may also arise from the deeper structures of the duct.

Tumors of the Bartholin gland often present such a typical course that it is apparent that there are several factors present in such cases which combine to produce an unique chain of symptoms. The tumor usually manifests itself clinically in the form of a painless swollen mass in the labium; this is accompanied by edematous infiltration of the adjoining soft tissues. With the advance of the disease pain and tenderness may also occur, the latter at times is very severe in character and may radiate out to the back or to the groin. There is a wide variation in the size of the tumor, its invasion of the surrounding tissues and in the microscopic findings when such are reported. The skin overlying the tumor may become tense and stretched; very often there is a tendency to ulceration, the tumor is then tender to palpation. As the disease progresses all the symptoms become aggravated. The pain may become more constant, and as infiltration of the surrounding tissues occurs the patient complains of drawing pains at the

site of the tumor; the latter is also tender on pressure. If secondary necrotic changes take place in the center of the tumor, it will fluctuate and give then an erroneous impression of an abscess of the gland. Because of the very rare occurrence of these tumors, they are as a rule, not accurately diagnosed, particularly in the presence of necrosis and secondary superimposed infections, both of which changes are very apt to occur. In the latter instances they are frequently interpreted as abscesses instead of tumors of the gland. The growth however usually progresses steadily and without periods of regression in size such as are usually seen in Bartholin gland enlargement of inflammatory origin. Furthermore, the surface of a malignant gland is more apt to be irregular and nodular than when enlargement is due to inflammation; the irregular nodules may be readily palpable. Later in the disease the tumor may become large, hard, and immovable. The skin over the tumor becomes red and adherent to it. Metastatic deposits are most frequent in the inguinal lymph nodes but they may also occur in the pelvic bones, adjacent tissues and even as far distant as the brain. This type of tumor may cause only local pressure symptoms or it may involve surrounding structures and metastasize to distant organs thus placing it in the class of malignant neoplasms.

Anatomically these tumors can usually be traced to the acinar or duct portion of the Bartholin gland from either or both of which they may arise. Both in architectural arrangement and in cytologic detail, they almost regularly have features in common with the Bartholin gland epithelium and consequently they may readily be recognized as having arisen from the gland. In the case of the tumor presented in this paper, the parenchyma was made up of specific tumor cells which approached very closely the mother tissue. The morphologic relation of the various components of the growth were very similar to that seen in the Bartholin gland and hence there was no doubt as to the exact source of origin of the neoplasm. A striking feature of this growth was its resemblance to malignant thyroid tissue, and is therefore of particular histologic interest. The duct element of the gland was uninvolved in this case, but in cases where it also participates in the formation of the tumor it adds another phase to the picture by introducing another type of cell, namely, that of a squamous cell carcinoma. Because of the two different kinds of epithelial cells that are found in the Bartholin gland, it is not surprising to find here two histologically different types of growth, namely, that of columnar and squamous cell carcinoma. This condition is analogous to that found in neoplasms arising from the cervical portion of the uterus.

The authors of previously published reports have indulged in various speculations as to the etiology and pathogenesis of the disease. Since gonorrheal infections of the Bartholin gland are most frequent, one is prompted to accept such infections as the responsible factors

for the diseased process. The etiologic theories for the association of gonorrhea with carcinoma of the Bartholin gland form perhaps the basis for some of the studies which have been made in this connection. It does not seem necessary however to prolong much further comment on the numerous theories associating infections with neoplastic formations. Infections are so usually a concomitant feature of this disease that it is mentioned in nearly all pathologic discussions. The fact that infections with gonococci are common in the Bartholin gland is not sufficient evidence to indicate that the former are the determining factors of the disease. There has been considerable direct and indirect evidence to indicate that such is not the case, and in the case of the patient reported above the question of gonorrheal infection could be entirely ruled out.

So far as treatment is concerned, early thorough operation offers perhaps the best chance of complete cure. When the tumor is still in the intracapsular stage and metastasis has not already taken place, complete resection of the entire growth gives the best results. A common source of failure in surgical procedure is the surgeon's inability to recognize at operation the malignant character of the neoplasm. In cases of nodular tumors of the Bartholin gland in patients of the cancer age in which there is some doubt as to the malignancy or non-malignancy of the tumor, the operation must be radical to the extent of removing every portion of the involved tissues. The pathologist must be on the alert to distinguish these proliferating tumors from ordinary slow growing adenomas or from more common inflammatory processes of the gland.

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I am indebted to Dr. H. M. Moore for his permission to publish this case. I wish also to express my appreciations to Dr. H. A. McCordock of the Department of Pathology of Washington University for making the photomicrographs used in this publication.

3720 WASHINGTON BOULEVARD.

RUPTURED CORPUS LUTEUM CYST, WITH MARKED INTRAPERITONEAL HEMORRHAGE

BY LOUIS RUDOLPH, M.S., M.D., CHICAGO, ILL.

MRS. M. S., twenty-five years of age, married ten years. Multiparae. Two previous pregnancies, labors, and puerperae uneventful. Five years ago had a similar attack, but recovered in four or five days. Last regular menstruation began on December 8, followed by irregular vaginal bleeding to the onset of this complaint, instead of the usual four- to five-day flow.

On December 22, while motoring she was seized with a sudden severe pain in the lower abdomen with difficult and painful urination, and a feeling of pressure on the rectum. A diagnosis of ectopic pregnancy or an acute exacerbation of a chronic salpingitis was considered and the patient treated expectantly. On the morning of December 25, the patient was fairly comfortable.

On December 25, at 2 P.M., patient was seized with a sudden acute pain in the right lower quadrant of the abdomen radiating to the back and down both thighs. Became weak, dizzy, and nauseated.

The patient was seen at 3 P.M.; she was in bed and listless, marked generalized pallor, and an anxious expression. The skin was clammy, and beads of perspiration on the forehead. Rapid respiration and gasping for air. The abdomen was distended, generalized tenderness, and marked rigidity of both recti. Right shoulder pain. Vaginal examination showed a relaxed introitus, stellate lacerated cervix, and a fullness of both fornices. The uterus could not be palpated on account of the condition of the abdomen. No subjective or objective signs or symptoms of pregnancy could be elicited. A diagnosis of a ruptured ectopic pregnancy or corpus luteum cyst with intraperitoneal hemorrhage. Immediate operation was advised and carried out.

Operation was done at the Lutheran Memorial Hospital. Preoperative temperature 99° per rectum; pulse 140, weak and thready; respiration 28; blood pressure 104/76; red blood count 1,800,000 and hemoglobin (Tallqvist) 40-50.

At laparotomy the peritoneal cavity was found full of clotted and free blood. The right adnexa was exposed and a thickened tube and an enlarged ovary were found. The tube and ovary, and the blood clots were removed.

Pathologic report: Fallopian tube 8 cm. long; the mid-portion was 1.5 cm., dilated with free blood in the lumen. The ovary was 3 cm., across and contained a hemorrhagic corpus luteum cyst. No gross evidence of placental tissue or fetus. Microscopic findings: Section of the ovary showed a corpus luteum cyst with hemorrhage within. Section of the fallopian tube showed no evidence of decidual reaction or inflammation. No chorionic villi were found in the fallopian tube or ovary.

On gross examination of the ovary, the cavity was deep, and appeared to be lined with a thickened membrane with a rough surface which could easily be peeled off, which was considered to be probably the amnion and the chorion which resembled an ovarian pregnancy.

Transfusion was considered, but not having a suitable donor, the patient was given 2000 c.c. of normal saline solution subcutaneously by the syringe method and 500 c.c. in the peritoneal cavity. Patient made an uneventful recovery and left the hospital on the eleventh day.

55 EAST WASHINGTON STREET.

Society Transactions

AMERICAN ASSOCIATION OF OBSTETRICIANS, GYNECOLOGISTS AND ABDOMINAL SURGEONS*

FORTY-FOURTH ANNUAL MEETING

White Sulphur Springs, Va., September 14, 15, 16, 1931

DR. EDWARD SPEIDEL, LOUISVILLE, KY., read a paper on the **Reduction of Fetal Mortality.**

DR. PALMER FINDLEY, OMAHA, NEBRASKA, read a paper entitled **Maternal Mortality and Its Relation to the Teaching of Obstetrics.**†

DR. GEORGE W. KOSMAK, NEW YORK CITY, read a paper entitled **The Responsibility of the Medical Profession in the Mortality From Childbearing.** (See page 748, November, 1931, issue.)

DISCUSSION

PROFESSOR L. ADLER, VIENNA, AUSTRIA.—In Austria the hospitalization of the labor case is always urged, and we all try to get as many cases as possible, not only of pathologic labor, but also of normal labor, into our hospitals and institutions. But we do not close our eyes to the fact that hospitalization is not abolishing all of the trouble.

The Viennese school has always been very conservative about obstetrics. We try to avoid too great radicalism and therefore perhaps our results are better than those elsewhere. We are trying to teach our students more of what nature can do during confinement rather than what art can do, and by doing this I think we have been able to show good results.

DR. W. R. COOKE, GALVESTON, TEXAS.—There are several points which might be made in regard to cesarean section. The first is the education of the student, for it seems impossible to reach the man who has been in practice a long time. I suppose most of us teach symptomatology and prophylaxis but do not teach much about the obstetric conscience. If teachers would give special attention to the development of the obstetric conscience, we might make some headway with the coming generation of general practitioners.

The second deals with the education of the general public. Women have been told a great many things through the lay press and otherwise so that they now demand prenatal care and thus have made better practitioners of many men. On the other hand, they have gotten an exaggerated idea of analgesia and they come in feeling that they should make no efforts and feel no pain. The obstetrician is apt to weaken and give in to the desire since he thinks cesarean section is not a dangerous operation.

*For lack of space in the JOURNAL, it has not been possible to publish all of the papers presented at this meeting. The discussions are likewise condensed. The complete proceedings may be found in the current volume of the Society's Transactions.

†Dr. Findley's paper was previously read in part at the White House Conference and has already appeared in abstract in the special issue of the JOURNAL published in June, 1931.

DR. KOSMAK (closing).—Dr. Cooke spoke correctly about the ease of operation and that is where we are making a great mistake. In performing an operation not only must one take into consideration the mere mechanics but the particular condition of that patient and whether she is a fit subject for cesarean operation. Stimulated by its technical simplicity some men are led into doing the operation, when they have not seen what goes before and do not realize what comes afterward.

As I said in my paper, it is unfair to compare the United States with the foreign countries because the conditions are so different. In Sweden in a series of over 3,000 deliveries at a large lying-in hospital there were just two cesarean sections in one year, one for placenta previa and the other for contracted pelvis. Why? Because the pelvis of those women are large. Going to Edinburgh one will see many more cesarean sections because the Scottish pelvis are not so large as the Swedish.

Answering Dr. Davis' question, I suppose he referred to what is considered a stillbirth. We are troubled with that same definition in New York. The New York Board of Health reports every infant death as a stillbirth if the products of conception are evident to the naked eye. The Academy of Medicine has attempted to change the situation but there are certain political and religious factors at work which prevent it. Of course, that does not enter into my statistics at all.

As regards the causes of death, our committee found a great many more cases in which the cause of death could be attributed to the delivery than to some other condition; in other words, a woman developing a pneumonia during the course of a puerperal sepsis was put down as dying of pneumonia when, as a matter of fact, she died of puerperal sepsis. Our committee has therefore added to the number of puerperal deaths rather than subtracted from it.

DR. A. J. SKEEL AND DR. FRANK F. JORDAN, CLEVELAND, O., read a paper entitled **A Consideration of Cesarean Section, With a Survey of 1047 Cases in the Cleveland Registration Area in Five Years.** (For original article, see page 172.)

DISCUSSION

DR. L. E. PHANEUF, BOSTON, MASS.—I have reported 418 cervical cesarean sections done by myself in thirty-four different hospitals. A large percentage of these operations were performed on women advanced in labor. I have looked up my last 238 cases, done with transverse cervical incisions. There were six maternal deaths or 2.5 per cent. The causes of death were septicemia in one, during an epidemic in Boston three years ago, in which several women died after perfectly normal labors. One death was due to lobar pneumonia, pulmonary embolism claimed two puerperal patients. One woman with a fibroid uterus died of acute cardiac dilatation. She had a mitral lesion which had caused considerable concern during her pregnancy. The sixth patient had a completely detached placenta and uterine apoplexy, a so-called Couvelaire uterus. She had total suppression of urine, having passed but one dram of urine during the twenty-four hours she lived after operation, and yet abdominal delivery offered her the only chance, slight though it was.

Unfortunately there will always be a mortality attached to cesarean section and I believe that the indication for which the operation is done is of paramount importance in determining this mortality. To illustrate, a woman with complete separation of the placenta has a better chance when delivered abdominally than she has when delivered through the pelvis, even though the mortality of cesarean section will be high in this group of cases.

I believe we could improve the statistics to a great extent by doing the low or cervical section in potentially infected women.

About twenty cases of placenta previa were delivered by the cervical operation. All the mothers recovered.

DR. ALBERT MATHIEU, PORTLAND, OREGON.—I have the privilege of reporting figures gathered by Dr. Theodore Adams of Portland, Oregon, covering the years 1926 to 1929 inclusive. This survey covers the city of Portland and practically all of Multnomah County, Oregon. There were during that time 19,500 births reported with an incidence of 217 cesarean sections or a percentage of 1.12. One-half of these cesarean sections, to be exact 110, were done by trained obstetricians and 117 by general practitioners. The mortality rate was 4.6 per cent and the fetal mortality was 10.1 per cent. It might be interesting to note that in 14 cases of eclampsia 11 cesarean sections were done by general practitioners with a mortality of 3.

DR. JAMES K. QUIGLEY, ROCHESTER, N. Y.—Attention has been called rather recently to the high incidence of pulmonary embolism following cesarean section. I want to ask Dr. Skeel if he has noticed it in his survey?

DR. D. L. JACKSON, BOSTON, MASS.—A few years ago, when there was a great deal of adverse discussion about cesarean section, my colleague, Dr. Raymond S. Titus, and I became rather perturbed about the subject and took occasion to study a series of cases from our private records, with special reference to cesarean section.

Among 2539 consecutive obstetrical cases in private practice, the number of cesareans was 258, or 10 per cent. Of these, 171, or 66.6 per cent, were primary cesareans, while 87 or 33.3 per cent were repeat cases.

The indications for operation were as follows:

Previous cesarean	87 or 33.3%;
High presenting part or pelvic disproportion	57 or 22.1%;
Toxemia	26 or 10.7%;
Previous hard labor	15 or 5.8%;
Separated placenta	8 or 3.1%;
Cardiac disease	14 or 5.3%;
Extensive repairs	13 or 5.0%;
Placenta previa	8 or 3.1%;
Age	7 or 2.6%;
Complicating fibroids	5 or 1.5%;
Constitutional diseases	5 or 1.5%;
Nephritis	4 or 1.5%;
Sterilization	3 or 1.1%;
Eclampsia	3 or 1.1%;
Diabetes	2 or 0.7%;
Ruptured uterus	1 or 0.4%.

In the total series the mortality was 18 cases, or 0.7 per cent. In the noncesarean cases the causes of death were as follows: In three undelivered cases, two patients died of influenza and one of mitral stenosis. Of the delivered cases, two patients died from placenta previa, two from embolus, one from toxemia, one from nephritis, one from shock or hemorrhage, one following transfusion, where in spite of the fact that the bloods seemed to match satisfactorily, they did not coincide in the patient, and one from influenza.

In the cesarean group, six patients died, a mortality of 2.3 per cent. The causes of death here were: Two from general peritonitis, one from mitral stenosis, one from separated placenta, one from embolus and one from cerebral hemorrhage on the tenth day, patient never having shown any symptoms of toxemia. The cause of death was not determined until an autopsy showed a definite cerebral hemorrhage.

Notwithstanding the fact that this series is not large, it seems to show that with the operation in the hands of selected operators the results of cesarean section will not show greatly increased mortality over the death rate resulting from other abdominal operations of election.

DR. JAMES R. McCORD, ATLANTA, GA.—Atlanta has a population of 350,000, eighty thousand of whom are colored. This discussion is a summary of an unpublished study by Dr. Colvin of Atlanta. During the five-year period from 1925 to 1930 in seven hospitals in Atlanta there were done 220 abdominal sections. The mortality was 5.5 per cent. The incidence was 1 in 92 hospital deliveries. The classical section comprised 86.4 per cent of the total and the low cervical 9.5 per cent, the Porro 4.1 per cent. The mortality in the classicals was 5.8, in the low cervicals 4.8 and in the Porro, 0. The morbidity in the classical group was 41 per cent and in the low cervical 38 per cent. In 20,286 hospital deliveries the cesarean incidence was 1.8 per cent. In 91.8 per cent pregnancy had reached the eighth calendar month. There were 55.9 per cent of primiparous women and 59.6 per cent were not in labor; 30 per cent had been in labor less than twenty-five hours. The membranes were unruptured in 81.8 per cent. The main indications for the operation were as follows: Contracted pelvis, 26.2 per cent (8.1 per cent of these had a previous cesarean for the same indication), toxemia of pregnancy 20.2 per cent, placenta previa 15 per cent and dystocia 10.4 per cent. Sterilization was done in 23.1 per cent.

The causes of the twelve deaths were as follows: General peritonitis 8, metastatic complications 2, ether pneumonia 1, and pulmonary edema 1.

The total fetal mortality was 16.4 per cent. In placenta previa it was 21 per cent, in dystocia 8.7 per cent, eclampsia 35 per cent, in preeclampsia 27 per cent. Fifty-four per cent of all the fetal deaths were attributed to prematurity.

DR. SKEEL (closing).—We had in our clinic 154 sections with 3 deaths, or about 2 per cent, during this period and we think our cervical section was responsible for the low mortality.

The purpose of this paper was twofold, first to show the desirability of cervical section; second to show that, because of the improved technic of cesarean section, the indications have widened to include a number of conditions from which women die no matter what you do for them; and that although the number of cesarean deaths is increased, because we are operating for dangerous pathology, the only way we can say whether the cesarean is desirable is to compare the results with the results of other treatments for those conditions. We are trying to show the comparisons in that way.

DR. W. WAYNE BABCOCK, PHILADELPHIA, PA., read a paper entitled **Submucous Perineoplasty**. (This paper is published in the current volume of the Society's Transactions.)

DR. RALEIGH R. HUGGINS, PITTSBURGH, PA., read a paper entitled **What Is Conservatism in the Treatment of Neisserian Infection?** (See page 187.)

DISCUSSION

DR. W. WAYNE BABCOCK, PHILADELPHIA, PA.—I can bear out what Dr. Huggins said regarding the relative safety of operating in the acute stage of gonorrheal salpingitis. Sometimes with apologies afterward, we operate upon these patients because we or others insist that they have appendicitis. Years ago I removed the purulent tubes and the patients did well. Later we closed the abdomen, but did a vaginal drainage without removing the tubes, and none of the patients had postoperative complications. Other cases we have simply opened, stripped the tube to obtain pus for examination and culture, and if no evidence of anything but the gonococcus was found, the wound was sewed up without any drain-

age. Despite contact with the pus, the abdominal wound healed without reaction and the patients were able to leave the hospital in eight or ten days. If vaginal drainage was done, they would go home in about two weeks and I do not recall any of these patients with an acute gonorrheal salpingitis with open tubes who later came back with pelvic complications.

The question has arisen whether we did not benefit these patients by what seemed at times an unnecessary operation. Of course, the small fallopian tubes from which the pus is escaping cannot usually be palpated through the vagina; and it is not surprising that a proportion of such patients is transferred from the gynecologic to the surgical service with a diagnosis of appendicitis. In such a case, in removing the appendix the tubal infection did not at least undergo exacerbation.

DR. HENRY SCHMITZ, CHICAGO.—Gonorrheal infection is essentially a self-limited process. If absolute rest for the genital organs is maintained, about 60 per cent of the cases will recover anatomically. Reinfections are due to two factors; the foci of infection in the cervix and the vulva have not been removed; or the pelvic organs have not been kept at rest, the patients resuming marital relations too early. Thus about 15 to 20 out of 100 cases become chronic invalids. They require some sort of an operation to remove the residues of the former acute infection.

It would seem to be a too radical precedent to operate on acutely inflamed tubes either of a primary infection or an exacerbation. I will admit that patients do recover after operation for acute appendicitis but that fact does not justify a similar management in pelvic infections. The highest ideal of the surgeon should be to save as much of the pelvic organs as can be done. Finally if only menstrual difficulties remain as prolonged, profuse or painful menstruation, then temporary sterilization with x-rays may relieve the patient. I believe that we should be particularly conservative in the treatment of pelvic infections in women.

DR. CHANNING W. BARRETT, CHICAGO, ILL.—Patients may recover if operated upon during the acute stage, but there is some mortality attached to operation at that time. It is also true that almost every case of pus tubes, gonorrheal infection, can be counted upon to be got into a quiescent condition. I have not found that so, however, with appendicitis. If we choose to operate upon a patient with Neisserian infection during the acute stage it may mean taking out both tubes and the ovaries, but if we wait for a quiescent stage we may remove the tubes and leave the ovaries, or at least one ovary, and the patient's future life will be normal.

If we operate during an acute stage of appendicitis, the source of the infection is being removed, but if we remove an acute pus tube, we take away only a part of the source of infection and the infection may go on in another part. In operating upon acute appendicitis we go down directly over the appendix and remove it without disturbing the peritoneum or distributing the infection, but if we go through the Neisserian infection field we may distribute it through the whole abdomen.

DR. JAMES E. DAVIS, ANN ARBOR, MICHIGAN.—I have examined about five thousand oviducts and in many instances where the infection was gonorrheal I could see no justification for the operation, and in the cases where operation had been done during the acute stage there was opportunity of following some of them to the autopsy room. I agree that it is very dangerous as a rule to operate upon these cases in the acute stage.

The ordinary experience is that the oviduct when infected by the gonococci will seal itself very quickly in the distal and proximal ends, and the contents within the tube will become sterile within a period of twelve or fifteen days where the walling off is effectually accomplished.

DR. ALBERT MATHIEU, PORTLAND, OREGON.—One of the sequelae of this infection about which little is known is the small mild type of hydrosalpinx. In my studies of sterility, using hysterosalpingography as a method of determining the site of the tubal obstruction, many cases of small hydrosalpinx not found on bimanual examination were unsuspected because the patient gave no history suggestive of a former gonorrheal infection. The hysterosalpingogram, however, showed the distal ends of the tubes as small sacs of iodized oil hanging down in the pelvis. In the twenty-four-hour film when the uterus and the proximal ends of the tubes had evacuated themselves of the iodized oil, there still remained these sacs of oil, visible evidence of small hydrosalpinges. These hydrosalpinges are on the average from 2 to 4 cm. in diameter and very thin walled, the wall contains scarcely any muscle and hence, has no contractile power and cannot empty itself and for this reason is still seen in the twenty-four-hour film. These hydrosalpinges are often seen at operation but are not often diagnosed before operation because they are so soft as not to be felt even under anesthesia.

DR. W. R. COOKE, GALVESTON, TEXAS.—Dr. Huggins is convinced that it is safe to operate on the acute tube. Dr. Barrett mentioned the fact that we have many sequelae by removing the tubes early, but Dr. Barrett did not mention the primary operative mortality. My own experience in that line may be worth something in a small way. Some years ago I had an idea that one could operate on acute tubes as safely as on the cooled off tube and in 500 laparotomies I had a mortality of 3 per cent, or 15 deaths. In 1924 I became more or less disturbed and began to operate only on the "cooled off" cases. The result was that during the last 3900 laparotomies we have had only 7 deaths from peritonitis. I am speaking solely of peritonitis deaths as proved by autopsies. Those 7 deaths out of 3900 cases were patients operated upon in violation of the rule of waiting until the pelvis was thoroughly cooled.

I should like to see the figures in support of the claim that we can operate in the acute stage with as low mortality as by waiting.

DR. HUGGINS (closing).—This discussion ended just about as I expected it to end. I tried to make it clear in the beginning of my paper that many of these patients get well without any operation at all; that we did not operate in the acute stage ordinarily, and that we certainly never operate unless the patient has had several attacks of this form of infection. It is the case that has gone on from three to five years with positive symptoms and recurring attacks that we referred to, and not a single individual who discussed the paper made mention of the effects of this infection or at least of its destructive effects on the ovarian tissue.

A case was recently seen in a young girl, twenty-three years of age, who came into the hospital with a third attack of salpingitis. Operation was delayed until the leucocyte count, and the sedimentation time were normal, and there was no elevation of temperature. At operation, one ovary was found to be completely destroyed by an ovarian abscess. Should the other tube, which was mildly diseased, be left with the risk that the other ovary become destroyed in a girl of twenty-three years of age? This result may be speculative, but it does happen, and these are the cases that come in our practice which give us great concern. There is no doubt about the wisdom of the conservative side of gynecology, but

some of these conditions are pertinent facts and cannot be destroyed simply by argument. So far as operation in the acute stage is concerned, it is our belief that when a woman comes to the hospital within the first twenty-four hours of an attack, which follows a number of previous ones, and especially after she reaches the age of forty, when the resistance is low, the danger of immediate operation is perhaps no greater than permitting her to go on with the infection as the course under these circumstances is very severe and not without serious risk. I called attention to the increased danger, so far as operation is concerned, that comes with each succeeding day, after the onset, when the infection is spreading through the lymphatics and over the peritoneum.

DR. M. PIERCE RUCKER, RICHMOND, VA., read a paper entitled **The Late Sequelae of Eclampsia.** (See page 211.)

DISCUSSION

DR. JAMES R. MILLER, HARTFORD, CONN.—In a paper read before the Connecticut State Society in May, 1931, Dr. H. M. Stander reported a five-year follow-up on toxemia of pregnancy in which there had been demonstrable renal damage. He showed that at the end of five years after the patient's first admission with renal damage 40 per cent of the patients had died. In this connection I would like to ask Dr. Rucker whether the eclampsia patients referred to includes both cases with and without demonstrable renal damage?

DR. W. T. McCONNELL, LOUISVILLE, KY.—I would also like to know upon what Dr. Rucker made his differentiation between cases of eclampsia and those complicated by preexisting renal damage.

One way of dividing these toxemias of late pregnancy is into primary and secondary. What I choose to call "primary" is one that does not depend upon any preexisting pathology. A secondary toxemia is one in which there is some predisposing pathology. Patients with a predisposing pathologic condition would show a much higher incidence of toxemia.

I feel sure that a patient whose toxemia is primary has very little chance of recurrence and I think, too, that a patient who has a toxemia, even though it is of a primary nature, which lasts a long time will suffer tissue changes which may predispose that patient to recurrence, whereas a patient who has an acute toxemia which causes perhaps visual disturbance, albumin in the urine, etc., if that duration is short and the conditions quickly subside, the patient will probably have no more recurrence than if she had never had any toxemia.

DR. RUCKER (closing).—By eclampsia in this paper I have meant simply late toxemias of pregnancy complicated by convulsive seizures. I have not attempted to differentiate between the types. For one reason, I did not feel capable of doing so and for the other reason they do not stay differentiated. The first in my clinic series, with many abortions, is a case in point. I think I would have decided for three or four years that it was a typical case of liver toxemia. This was an unmarried girl who was confined by a midwife. She went into convulsions after a six months' abortion. She afterward married and had three living babies, without any signs of toxemia, and then had a series of abortions. These abortions were accompanied by high blood pressure, toxemia and albuminuria, and finally she died of typical cardiorenal disease with a big heart, a big liver, and a big bleeding uterus. So I was at a loss to know exactly how to classify these patients. For that reason I have taken eclampsia to mean simply late toxemias of pregnancy accompanied by convulsions.

DR. SAMUEL D. SOULE, ST. LOUIS, MO., read a paper entitled **A Study of Thyroid Activity in Normal Pregnancy.** (See page 165.)

DISCUSSION

DR. A. K. PAINE, BOSTON, MASS.—It is particularly interesting to clinicians to know whether the physiologic increase in thyroid activity during pregnancy predisposes to, or increases the possibility of, true thyroid disease requiring medical or surgical treatment. The impression I have gathered is that this physiologic increase during pregnancy is of no great clinical significance. I would like to ask the authors of the paper whether, as a result of their work, they have any information to advance along this line.

DR. G. D. ROYSTON, ST. LOUIS, MO.—This interesting paper brings out the frequency of hypothyroidism during pregnancy. Geographical distribution of thyroid reaction is important and, according to Maceomber, the supply of iodine in the food and water steadily diminishes in localities more than fifty miles distant from the sea. Certainly in St. Louis we have a great many minus metabolic readings.

Drabkin in St. Louis has recently brought out the frequency with which minus basal metabolic readings occurred in his series when doing daily metabolic determinations during the last two weeks of normal pregnancy. Another interesting feature of this work was the marked variations that sometimes occurred from day to day in the same individual. His work was checked with the apparatus used on the internal medical service and the metabolism service, with identical results.

It is our custom to do routine basal metabolic determinations on all private pregnancy patients. In looking over the last 300 consecutive private pregnancy records 61.33 per cent showed minus readings; 5 per cent showed a zero reading; 33.66 per cent showed a plus reading. The readings were as follows: 5 per cent were 0 per cent, 21 per cent showed minus 1 per cent to minus 5 per cent, whereas 17 per cent showed plus 1 per cent to plus 5 per cent. Fourteen per cent showed minus 6 per cent to minus 10 per cent readings, while 12 per cent showed plus 6 per cent to plus 10 per cent readings. Seventeen per cent showed minus 11 per cent to minus 15 per cent, and 4 per cent showed plus 11 per cent to plus 15 per cent readings. Five per cent showed minus 16 per cent to minus 20 per cent, whereas 2 per cent showed plus 16 per cent to plus 20 per cent. Only one-third of 1 per cent showed minus 20 per cent to minus 25 per cent, whereas 2 per cent showed plus 20 per cent to plus 25 per cent readings during pregnancy. My associate, O. S. Krebs, will make a clinical analysis of our results in a later publication. These readings were done during the first and second trimesters and at term, and a fourth determination was done at the end of the puerperium.

Minus readings ordinarily became lower, while plus readings became slightly higher with advancing pregnancy, although the rise was to a lesser extent than the fall in the basal rate among the negatives. There was a tendency for the underweight patient to gain and the overweight patient to reduce in weight during the administration of thyroid, yet in some instances the minus basal readings often dropped in spite of thyroid therapy.

Among the patients with hypofunction, lassitude and nervous depression were frequent accompaniments, while a tendency to toxemic symptoms, abortion and postmaturity, followed by subinvolution was not uncommon. Menstrual disturbances, menorrhagia (though more frequently periodic amenorrhea), oligo-amenorrhea and sterility were often noted. It was surprising how often subinvolution seemed to be associated with thyroid disturbances. Certainly in the St. Louis area hypothyroidism during pregnancy is a matter of frequent occurrence and is commonly overlooked.

DR. SOULE (closing).—In reply to Dr. Paine's question, we have made no particular attempt to correlate this experimental work with any clinical findings and offer it purely as scientific evidence of an increased amount of thyroid hormone during pregnancy.

DR. E. MACD. STANTON, SCHENECTADY, N. Y., read a paper entitled **Stoneless Gall Bladder; a Study of Operative Cases.** (This paper is published in the current volume of the Society's Transactions.)

DR. JAMES F. BALDWIN, COLUMBUS, O., read a paper entitled **The Treatment of Pus Tubes.** (See page 207.)

DISCUSSION

PROFESSOR L. ADLER, VIENNA, AUSTRIA.—I think Dr. Baldwin has omitted mention of the vaginal incision probably on purpose because, as is our custom in Vienna, we do vaginal drainage of pus tubes not as a routine but only as a matter of necessity: If the temperature rises, the pains are unbearable and the danger of general peritonitis or rupture is imminent. We are conservative and vaginal incision is more radical than if you wait a long time and then do whatever later operation may be necessary.

DR. CHANNING W. BARRETT, CHICAGO, ILL.—I have seldom found it desirable, and can hardly appreciate the taking out of pus tubes and failing to cover their raw surfaces. There is scarcely any condition more likely to become infected at the point of suture, and the peritoneum furnishes an opportunity for covering the raw surfaces with the greatest facility.

As to retaining menstruation, I believe if we could save childbearing patients this function when we operate, we should do so, but in pus tubes that is almost out of the question. I believe most patients would prefer to have a genital senility postponed for ten years rather than shortened by ten years.

Regarding the fixation of the sigmoid to the pelvic brim, I believe the less fixation that is done the better off the patient is. The worst that can happen to an uncovered surface is that the sigmoid or the cecum or the bladder might become adherent to it.

DR. WILLIAM H. WEIR, CLEVELAND, OHIO.—Dr. Baldwin's method of suturing the cecum and sigmoid across the brim of the pelvis to cover over extensive denuded areas is not necessary in most pus-tube cases; in fact, I prefer to mobilize them if they are involved in adhesions. The procedure, however, is of great value if the bladder, ureter or rectum has been so injured that there is danger of a fistula developing, or in the presence of an unusually virulent infection. It is quite possible to create a dam between the pelvic and abdominal cavities by the technic he describes and vaginal drainage will then take care of any possible leakage or infection. If a panhysterectomy has been performed the same end may be easily secured by suturing the very movable vesical reflection which has been dissected off the front of the uterus, to the anterior surface of the sigmoid and cecum.

As to the importance of maintaining the menstrual function, my experience has been that if the true facts of the case are explained to the patient she will be very glad to be rid of menstruation. Whenever possible it is advisable to retain an ovary even if the uterus has been removed so that the possibility of senile changes may be lessened and that the immediate convalescence will not be complicated by the flushes and other nervous manifestations of the menopause. By preserving an ovary one may at least assure the patient that she will not, as she fears,

become old, fat or gross. To allow menstruation to continue when there is no possibility of pregnancy seems unnecessary and most women will welcome the freedom from menstruation provided they clearly understand the situation.

DR. A. K. PAINE, BOSTON, MASS.—Repeated attacks of pelvic inflammation have been mentioned here a number of times as an important factor in the decision to operate on these cases. The observation of some 500 cases of gonorrhea in women in the Boston Dispensary over a period of fourteen years has demonstrated that these repeated attacks bear a very definite relation to a continuation of the infection.

When there are repeated attacks of pelvic inflammation one should not first consider what variety of surgical treatment is to be employed; he should first find out if he is not dealing with an uncured gonorrhea the cure of which may result in a cessation of these repeated attacks of pelvic inflammation. It was interesting in the above series to note that the most troublesome recurrent pelvic inflammatory reactions were sociologically grouped as occurring in married women, where obviously the element of continuing infection or reinfection is most common.

Regarding the surgical management of these cases, our experience has led to the formulation of some rather definite rules of procedure: no abdominal operation in the first year; if a given acute attack does not clear up in ten days, the case is drained vaginally. Less than one-half of one per cent of these drained cases have required subsequent operation. Pregnancy subsequent to vaginal drainage is not uncommon. Abdominal operation is reserved for the late case, with the pathology of postinflammatory degeneration and the so-called secondary neurological symptom complex these patients so frequently describe.

DR. S. E. TRACY, PHILADELPHIA, PA.—Any structure in the pelvis which is healthy, or which will recover, should be conserved. Suspension of an ovary after a conservative operation is most important. To allow such an ovary to drop down in the pelvis is almost certain to cause future trouble. Dr. Baldwin's technic for the disposition of an infected, traumatized or oozing pelvis is admirable. We have been using a similar technic for several years. Instead of packing gauze into the vagina and pelvis, rubber tissue is used which does not dam back the fluid and which upon removal causes the patient decidedly less pain and discomfort. The sigmoid when placed over the rubber tissue closes the pelvis.

In patients on whom a hysterectomy has been necessary, the bladder peritoneum is sutured to the infundibulo-pelvic ligaments at the side of the pelvis. The sigmoid is dropped down and the bladder peritoneum is attached to one or two epiploic appendages and in a few hours the pelvis becomes an extraperitoneal cavity.

DR. S. J. GOODMAN, COLUMBUS, OHIO.—Before we take the statistics offered by Dr. Barrett too seriously I think we should know whether the different men had the same type of cases. One man may have run into a group of very serious cases and the other not. Furthermore, the man who lost no cases in a large series may have been a very competent surgeon, whereas the man who lost six cases may not have been such a good surgeon.

DR. HENRY SCHMITZ, CHICAGO, ILL.—In the treatment of these chronic pus tubes one should remember that the more conservative the treatment is, compatible with the conditions found, the better off our patients will be. It makes a great deal of difference whether the menstrual function is retained or not. A patient who is young and who has ceased menstruating is as a rule unhappy. And it is only exceptionally that a woman feels very happy when she has been relieved of her sexual functions. However an exception does not prove a rule, and a rule does not prove an exception.

DR. BALDWIN (closing).—My patients are all private patients; many of them are poor, but they are my private patients just the same, and I study each case individually, see the patient twice a day until she leaves the hospital, and take very thorough histories. I know that when such patients, after a hysterectomy, report for any reason, they all seem very glad that there is no longer any menstruation.

My intent in operating on these cases is to save everything that may be of benefit to my patient and that will do no harm; therefore, I object to leaving the cervix. I note that Dr. Charles Mayo has recently come out in warm approval of the routine removal of the cervix in cases of hysterectomy, and I notice also that a number of foreign surgeons are advising the same procedure, thus not only obviating the danger of cancer, but also of leucorrhea, dyspareunia, etc.

In the many cases in which vaginal drainage is indicated, the sigmoid can be easily swung around over a gauze fluff and attached to the peritoneum at the brim of the pelvis. I described in full my technic in a paper which I read before this Association many years ago, by which I save much of the peritoneum from the anterior surface of the uterus so that its attachment to the sigmoid does not displace the bladder and is made with no tension at the point of union. At the clinical meeting of this Association at Columbus, some years ago, I presented what had been one of the worst cases of puerperal infection I had ever operated upon. The patient was young. I put in the gauze fluff as advised, was able to save one ovary, swung the sigmoid around, and she made a perfect recovery.

I always save an ovary in women under forty if the ovary is healthy. In one case I was able to save only a little piece of an ovary, about the size of a pea, but the woman recovered and later was delivered of twins. In cases in which the ovaries are the seat of abscesses they cannot, of course, be saved. In one case, in which I had been obliged to remove both ovaries in a young woman, I later, because of her complaining of loss of libido, transplanted an ovary, and with apparently perfect results. If the ovaries are saved, in cases in which the sigmoid is used, the ovary should be brought up above the sigmoid so that it will not be imbedded in adhesions.

Recently I was asked to see a patient, aged thirty-four, a widow for two and a half years, with three children. She had developed an acute pelvic condition of 48 hours' standing. During her fourth pregnancy she had had an abortion induced, and the resulting infection had left her a chronic invalid, practically everything in the pelvis being in a conglomerate tender mass. This condition had been present for three years, but within 48 hours there had developed an acute condition and the question was whether we were dealing with an appendicitis or a lighting up of the tubal involvement. Examination showed the pelvis filled with the old mass, which was tender throughout, but immediately back of the cervix was an exceedingly tender spot, which with the acuteness of the symptoms I was inclined to look upon as the appendix and hence advised an immediate operation. At operation the appendix was found extending down to the bottom of the culdesac; was gangrenous, had perforated, and was in a little pocket of pus. Everything was dug out and removed, but one ovary was saved, a gauze fluff used with mobilization of the sigmoid, and a perfect recovery ensued not only of the appendicitis but also of the pelvic conditions.

I have removed about 6000 uteri and in cases such as I have described the safest procedure is to remove all the diseased structures but save an ovary or ovaries in young women, but with particular care to peritonealize the entire surface and carefully smooth out the omentum as it is brought down to cover the field of operation.

PROFESSOR L. ADLER, VIENNA, AUSTRIA, gave **The Fourth Joseph Price Foundation Lecture: The Treatment of Carcinoma of the Cervix by Vaginal Hysterectomy and Radium.** (To be published in a subsequent issue of the JOURNAL.)

DR. ARTHUR H. BILL, CLEVELAND, OHIO, gave the **President's Address: The Newer Obstetrics.** (See page 155.)

DR. JAMES E. DAVIS, ANN ARBOR, MICH., read a paper entitled **A Critical Study of Twelve Hundred Cervices.** Published in the current volume of the Society's Transactions.)

DR. STEPHEN E. TRACY, PHILADELPHIA, PA., read a paper entitled **Carcinoma of the Uterus Complicated by Tubal Gestation.** (See page 223.)

DISCUSSION

DR. ERWIN VON GRAFF, IOWA CITY, IA.—In my material of cancer of the cervix operated upon by the Wertheim method, in the first 1000 cases there was found one case of tubal pregnancy as an accidental finding. The patient had no symptoms or they were overlooked. She had a persistent bloody discharge. The second patient was one upon whom I had operated myself. It was again an accidental finding. There was a tremendously large cauliflower tumor, and also an undisturbed ectopic pregnancy. The most astonishing thing about this case was that the pregnancy was not more advanced than six weeks and yet there was a large cancer present. Conception must have taken place in spite of an already developed cancer.

DR. HENRY SCHMITZ, CHICAGO, ILL.—It is natural that the cases of tubal pregnancy associated with carcinoma are rare. I wish to report a recent case. The patient was a primipara, twenty-five years of age, who was near full term. She entered the hospital because of very profuse discharge with a bad odor, not thinking that anything might be seriously wrong. She had a cauliflower growth, well advanced. The difficulty which arose was solved as follows: An extraperitoneal low cesarean section was recommended. As soon as the patient recovered from this operation the cervix was treated with radium and eventually the woman recovered; that is, she was entirely free from carcinoma.

If in the presence of such an extremely advanced carcinoma of the cervix a Porro operation had been done, the patient would have succumbed to septic peritonitis.

Strange to say, this patient had a sister who became pregnant when she was twenty-four years of age and died from carcinoma of the cervix before the pregnancy was completed.

DR. JAMES E. DAVIS, ANN ARBOR, MICH.—I have in my collection two cases of carcinoma of the oviduct, one extending from fundal carcinoma, and the other occurring coincidentally with carcinoma of the cervix. There is no reason why cancer cannot be multicentered in these organs.

DR. TRACY (closing).—A patient was referred to me because of metrorrhagia. At examination the question of pregnancy arose, but a positive diagnosis could not be made. The patient had a cervix which was lacerated and ulcerated and bled on the slightest manipulation. It was finally decided that the patient was also pregnant. A biopsy was made and the pathologist reported a carcinoma of the cervix uteri. The patient was at this time about four months pregnant.

The following week at a hospital conference, another pathologist denied any microscopic evidence of malignancy. He stated that there is a peculiar cell arrangement in the cervix during pregnancy and unless one has encountered it frequently he is likely to make a mistake in the diagnosis. A second pathologist concurred in this opinion. The patient had a miscarriage two weeks later and after she had recovered the laceration was repaired. The entire tissue secured at operation was examined histologically and no malignancy was found. Such a condition as this should be borne in mind as radical treatment in a young woman would be most unfortunate.

DR. CHANNING W. BARRETT, CHICAGO, ILL., read a paper entitled **Diverticulosis and Diverticulitis**. (Published in the current volume of the Society's Transactions.)

DR. PAUL TITUS AND DR. J. R. EISAMAN, PITTSBURGH, PA., read a paper entitled **Eight Months' Extrauterine Pregnancy, Calcified, and Retained for Forty Years**. (See page 217.)

DISCUSSION

DR. EDWARD L. CORNELL, CHICAGO, ILL.—I have never seen a similar case in the history of the Chicago Lying-In or the Cook County Hospitals.

Masson and Simon in 1928 reported 9 cases from the Mayo Clinic and 174 in the literature. They stated that Schuman showed an incidence of 1.5 per cent in all cases of ectopic pregnancy. The incidence at Mayo's was 2 per cent. These percentages cannot represent the incidence in the United States else we should all see many more cases.

Abdominal and tuboabdominal pregnancy is not rare as the literature, especially in the past five years, is filled with reports. These cases are being recognized now especially since our diagnostic measures are becoming more refined.

DR. D. L. JACKSON, BOSTON, MASS.—I know of several cases of lithopedion. The first was in a woman of twenty-nine who had had two previous pregnancies. Five years ago the patient had no periods for six months. Subsequent to an automobile accident she was in the hospital for two weeks and was told at that time that she was not pregnant. One year after the accident she had severe pain in the lower abdomen with cramps and diarrhea. After treatment by her physician she improved for a time but later had an attack of diarrhea every six months. X-ray pictures confirmed the diagnosis of lithopedion.

In the second case, three years previous to the removal of the lithopedion, the patient was operated upon for extrauterine pregnancy, but her condition was such at the time that the tube was quickly tied off to control bleeding and the abdomen closed. At the end of three years the patient, having had a miscarriage in the interval, complained of a pain in the right upper abdomen. A mass was found in the region of the gallbladder. An exploratory operation was performed and a lithopedion was found adherent to the gallbladder and duodenum. It was fixed by numerous capillaries which caused considerable bleeding at the time of removal.

The third patient had an apparent pregnancy thirty years previously which never terminated, and the reason was not investigated in any way, as the patient lived in a remote district where medical attention was difficult. Subsequently the patient was seen and operated upon for an abdominal tumor which turned out to be a lithopedion.

I would like to ask in regard to the deposit of calcium in these cases after the cessation of growth of the fetus. In the slides shown there seems to be more bony

structure laid down than one would normally expect to find in fetuses of a stage of development corresponding to the duration of time as given by the history in these cases.

DR. WILLIAM H. WEIR, CLEVELAND, OHIO.—A case was recently encountered showing that calcification is not necessarily present although the term lithopedion is generally employed for this condition. A colored woman had had a large, hard tumor in the midline of the lower abdomen for about ten years. There was no suspicion, either from the history or the examination, that it was tubal pregnancy and it was diagnosed as a fibroid. The pelvic organs were so densely adherent that at first it was almost impossible to identify them. The main tumor proved to be cystic and during its enucleation the wall was torn allowing the escape of some fluid which suggested that it was an ovarian dermoid. It proved however to be the sac of an old tubal pregnancy and in the bottom of this were found all the bones completely disarticulated and with not a fragment of the soft tissues adhering to them. The fetus had reached a development of about six months.

DR. CHANNING W. BARRETT, CHICAGO, ILL.—We operated some years ago upon a colored woman for a fibroid tumor about the size of a seven months' pregnancy. There was no history of a pregnancy at the time. When we had removed the large fibroid a sac was found posterior to it. Upon tracing the sac to its pedicle we found that it went down to the right tube and in the sac contained a rather oily fluid. The sac was flaccid and contained a perfect disintegrated skeleton. There was not the least evidence of muscular tissue, no calcification, and even the three little bones of the ears were apparent and hair was found in two places.

DR. F. H. FALLS, CHICAGO, ILL.—Some years ago I endeavored to produce experimental abdominal pregnancy in dogs. I did a cesarean section and put one pup in the abdomen leaving the placenta in situ. I found that dogs almost invariably aborted and the pup in the abdomen died. Almost all of the pup was absorbed, including some of the bones. Apparently in the peritoneal cavity of the dog there was absorption of the bone calcium instead of deposition of calcium.

DR. P. BROOKE BLAND, PHILADELPHIA, PA.—Some years ago I reported a similar case. The patient, regarding herself as normally pregnant in due time—between the eighth and ninth month, experienced the usual false labor, as I imagine all these patients do, and subsequently she carried a calcified fetus for a period of thirteen years. During that time she gave birth to two normal babies at full term.

DR. JOHN W. KEEFE, PROVIDENCE, R. I., read a paper entitled **Volvulus of Large and Small Intestine**. (Published in the current volume of the Society's Transactions.)

DR. EDWIN P. SLOAN, BLOOMINGTON, ILL., read a paper entitled **Abdominal Incisions**. (See page 226.)

DISCUSSION

DR. W. WAYNE BABCOCK, PHILADELPHIA, PA.—This is a very ingenious incision and is the most original method of closure of the abdominal wall that has been developed in the last twenty years. With contracted abdominal muscles, we have all experienced the difficulty in closing an incision in the upper abdomen, especially if gas oxygen, local or even ether anesthesia is used. It is difficult to produce accurate approximation of the peritoneum and of the under layer of the sheath of the rectus muscle with rigid muscles; and it is not surprising that Dr. Sloan has found that the results of closure under these conditions is often imper-

fect. Where large incisions are necessary for very extensive work in the abdomen, this operation is to be considered. Of course with the relaxing anesthetics, as Dr. Sloan has mentioned, the need for the larger incision is not as great; and if spinal anesthesia lasts long enough, it is relatively easy to operate satisfactorily through a comparatively short vertical incision with satisfactory closure of the muscles and fascia.

We also have to consider in relation to the anesthetic used whether during an operation a large opening is going to hamper us or not. Very often in using local anesthesia it is desirable to have sufficient bridge or covering for the upper abdominal contents, so that they will not be extruded by the straining of the patient; therefore, the incision should be planned so that the viscera not operated upon will be held in. The high transverse incision in such cases is often very helpful.

DR. WILLIAM E. DARNELL, ATLANTIC CITY, N. J.—Dr. Sloan pictures only the upper incision. He refers to the fact that always under the peritoneum there are adhesions with almost every abdominal incision, which is quite true. The point I want to make refers to the lower rather than the upper abdomen, where the tension is not so great. For many years, instead of whipping over the peritoneum layer to layer, we imitate the Connell intestinal suture. In our experience this is productive of very much fewer adhesions underneath the peritoneum than with the other method of suture because there is no raw surface underneath. No doubt the sutures have some part to play in the irritation which causes adhesions.

DR. SLOAN (closing).—It is true that with any muscle-splitting incision there is little or no exposure without retraction but in the incision described retraction of the flaps upward and downward provides a wide exposure. One advantage of all muscle-splitting incisions is that they can be easily closed without complete relaxation. With general anesthesia relaxation is lost before sensation returns. It is very difficult to close a vertical incision with a patient in this stage of anesthesia. The incisions described can be easily closed under such conditions.

DR. ERWIN VON GRAFF, IOWA CITY, IOWA, read a paper entitled
Abdominal Total Hysterectomy. (See page 195.)

DISCUSSION

DR. WILLIAM H. WEIR, CLEVELAND, OHIO.—With every word of this paper I heartily agree. When performing a hysterectomy, I practically always remove the entire uterus, rarely doing the supravaginal operation. In one of Dr. von Graff's statistical tables the results from our clinic are quoted. These show a lower mortality for panhysterectomy than for the supravaginal procedure. Panhysterectomy is generally regarded as a much more difficult procedure than the supravaginal but we do not feel that it need be, and in simple, uncomplicated cases we have been able to perform it, including the abdominal closure, in twenty minutes. I simply state this to show what a simple procedure it may be and my assistants soon learn to carry it out with facility and rapidity. We feel that our results with the complete operation are a great deal better than if the whole or part of a crippled uterus is conserved and the danger of subsequent cancer development in the cervix is avoided. Most of our cases are complicated by the existence of infection, tumor formation or more or less extensive birth traumata and in a large proportion of them a preliminary perineorrhaphy has to be performed. The more complicated the case the more apt are we to do a panhysterectomy.

DR. EDWARD J. ILL, NEWARK, N. J.—I have lived a long while in the profession and have seen the pendulum of enthusiasm swing from one extreme to the

other and settle at last to a normal quiet rhythm. I have become suspicious of extreme views. I consider that facts and figures are often misleading under changed conditions. I hold that the results of operation of such eminent men as have presented the subject under discussion are those of experts and of teachers of high standing. They are perfectly right when they urge the total removal of every uterus where there is severe disease of the cervix or the canal. Whenever there is an indication to do so for fibroids there is an increased death rate of one-half of one per cent. When one goes along with several hundred cases of supravaginal amputation without losing a patient, one-half of one per cent loss looks rather large to me. Let us remember that often enough a badly diseased cervix has already developed a cancer when a supravaginal operation was done. Out of about 1200 cases I have operated on, I have seen cancer develop once, seven years after supravaginal removal.

I feel that I can only rely on my own personal experience in forming a judgment, and not on that of my colleagues who work in the same institutions as myself. When one considers that a vast majority of patients that are operated on for fibroids have tumors which produce no symptoms, in other words where there is no real indication for operation, and who will never die from these tumors; and when we consider that 28.6 per cent of all women after thirty-five years of age have fibroids, there must be a tremendous death rate in a country like ours where every man operates and not only the masters. This death rate must be tremendously increased when abdominal operations are urged and performed by others than the masters. Let us remember that what we say here and publish in the journals of the country form the basis of action which many not qualified think they must upset.

My authority for saying that 28.6 per cent of all women after thirty-five years of age have fibroids is from a study of the autopsy records of the Massachusetts General Hospital and The Johns Hopkins Hospital. That would mean that there are 450,000 women in the State of New York with fibroids. Imagine total hysterectomies being done in all those cases, not only in the large hospitals, but in every village and small town. What would the death rate amount to?

Such teaching must go out with caution. Dr. Hoffman through the public press has already told us that we have five times as many deaths from appendicitis as Italy has, not because they have better surgeons or we fewer masters, but because anybody seems qualified to remove the appendix. Extreme views are apt to be erroneous and harmful.

DR. W. R. COOKE, GALVESTON, TEXAS.—There are three points that have to be taken into consideration in this particular problem. The first is the skill of the operator; the second, the pathologic condition with particular reference to the parametrium; and third, the patient herself. With the occasional pelvic operator we find that the mortality in total hysterectomy is at least one and a half times as great as against subtotal hysterectomy. We might say that with an average operator one thousand out of one hundred thousand women would lose their lives as a result of the routine adoption of complete hysterectomy, but with a skilled operator that is not true. A great many skilled operators will have a lower mortality for the complete than for the supravaginal operation. I think that is due to the fact that the appropriate cases can be selected by a competent gynecologist. I think the best rule for the occasional operator is to treat any cervical condition less than malignancy with the cauterizer. The incidence of death from cancer in the stump is certainly less than the actual 2 per cent mortality with the average operator. Again, you can cure some cases of cancer, but you cannot cure the cases of postoperative death. If a patient returns for examination and reports symptoms, the cervix can easily and safely be removed.

In the case of patients who will not return for observation of the cervix after supravaginal hysterectomy, there is of course a greater risk of the development of pathologic conditions in the cervical stump. Very often the best procedure in cases of this type is to perform a complete hysterectomy. Nevertheless, for the occasional operator to make use of this argument will lead to a great many unnecessary operative deaths.

DR. L. E. PHANEUF, BOSTON, MASS.—My own tendency has been in the last few years to do more and more total hysterectomies. I believe it is bad surgery to leave behind a badly lacerated cervix with ectropion, because of the danger of cervical carcinoma and also because of the accompanying posterior parametritis and backache which persist. I quite agree that in the hands of experienced operators the mortality of total hysterectomy should not be much greater than that of supravaginal. I do maintain that in the hands of the occasional operator the mortality of the total operation will be very much higher. Drainage, of course, is very much better instituted after the total operation than after supravaginal amputation. Personally I limit the subtotal amputation of the uterus largely to nulliparous women who have a healthy cervix upon whom I operate for fibroids of the uterus, and to the woman who has some constitutional condition which contraindicates the total ablation which is more extensive, takes longer to perform and which adds to the risk in the woman in poor physical condition.

DR. C. J. BONIFIELD, CINCINNATI, OHIO.—It seems to me that the statistics are not nearly of so much value as they appear to be on the surface, because each operator has his own reason for doing either a supravaginal or a complete hysterectomy. One of them does the supravaginal hysterectomy in easy cases, another does it for some other reason. No two operators are guided by exactly the same principles and it is very hard to compare their results. Any one who sees a great many people operate must realize that the danger is very much less in the supravaginal type of operation.

The pictures shown were of small uteri that anyone can easily remove, but when there is a large fibroid uterus, possibly involving one or both broad ligaments, and wide dissection is necessary, removal of the entire cervix is a very much more difficult operation than has been indicated by the discussants.

Dr. Phaneuf said he wanted to emphasize the fact that one should not leave the cervix if diseased. If a cervix is badly diseased, of course a total hysterectomy will be done, but in many comparatively healthy cervixes, and especially if the operator will hollow out the cervix well down toward the external os and leave it in a healthy condition, there will be no symptoms returning. At least, that has been my experience for a quarter of a century.

One speaker referred to fibroids coming after operation. His experience has certainly been different from mine and I would be inclined to think that those cases where he saw fibroids developing after the supravaginal hysterectomy had a little fibroid in the cervix at the time of operation and it simply continued to develop, having a very liberal blood supply. Personally I have never seen a fibroid develop in a cervix that was left behind.

DR. VON GRAFF (closing).—I want to say a few words concerning the technique. We purposely never fix a stump of the adnexa to the stump of the vagina, being afraid that some infection might involve the stump, and we are rather anxious to keep the stumps of the adnexa where they are and not bring them too close to the vagina. We also keep the vagina open; this affords the very best natural drain.

Dr. Weir mentioned one very important point. He said that his younger pupils are able to make a total hysterectomy without any difficulty or danger. That

raises the question whether one should decide to leave for the young operators the subtotal operation, as Dr. Cooke has suggested, reserving the total hysterectomy for the skilled operators. I feel that when a man is able to perform a subtotal operation only, the danger arises that he might sometime perform that operation in cases where total hysterectomy would have been advisable. I would rather suggest to teach the men who go in practice to do operative work, so far as they are capable to perform safely, a total hysterectomy, which would solve the problem satisfactorily for both patient and physician.

DR. PERCY W. TOOMBS, MEMPHIS, TENN., read a paper entitled
The Role of Focal Infections in the Etiology of Toxemia of Pregnancy.
(See page 199.)

DISCUSSION

DR. LESTER A. WILSON, CHARLESTON, S. C.—While there are conditions which point toward the infection theory, I am not convinced that the pregnancy toxemias are due to infection alone. Metabolic changes and endocrine disturbance both must be seriously considered. Further evidence of the infection theory are: the elevation of temperature in the newborn, jaundice of the newborn, the frequency of cholecystitis in toxic patients, and that we often find the blood pressure remaining high after delivery. I have recently treated two cases in which the symptoms of toxemia definitely subsided after the removal of infected teeth.

DR. R. T. LAVAKE, MINNEAPOLIS, MINN.—A summation of clinical and experimental data leads me to be more and more certain that infection frequently plays a most important rôle in the causation of true preeclamptic toxemia. To my mind it operates by increasing the load of the organs of elimination, by reducing the efficiency of these organs, and by producing placental necrosis. I believe Young to be correct in tracing the specific toxin in preeclamptic toxemia to placental necrosis. Though there is quite conclusive evidence that infection is only one of the possible causes of placental necrosis, of all suggested causes infection is the only one over which we can have any control and thus the practical value of this concept. As Dr. Toombs has intimated, this concept gives direction to our prenatal care. It directs the clearing up of foci of infection where possible, and in the presence of unavoidable infection it directs an increase in vigilance to detect the earliest sign of approaching toxemia.

If the placental necrosis theory of true preeclamptic toxemia is correct, we must explain the many cases in which massive necrosis gives no evidence of toxemia. In this regard increasing clinical and experimental data point to the likelihood that the presence or absence of this toxemia rests upon the presence or absence of toxicity in the placental cells, dependent upon their progenitor, the fertilized ovum. That fertilization can turn a nontoxic ovum into group of cells highly toxic to the mother is borne out by much clinical data. If nontoxic, massive necrosis may cause premature labor but will not cause true preeclamptic toxemia. If toxic, necrosis may cause premature labor and will cause toxemia, the degree of toxemia likely being dependent upon the extent of the necrosis, the toxicity of the ovular cells, the damage sustained by the vital organs of the mother, and the ability of her excretory organs to eliminate the toxin. That the toxin is not specific for all women is proved with reasonable certainty by the fact that the blood of toxemic women has been used for transfusions with no apparent harm to the recipients. I bring in this consideration of placental necrosis because I believe it is a link in the modus operandi of infection in the production of toxemia entirely apart from any adjuvant action of infection in the findings brought about by nephritis and the low reserve kidney. I consider Dr. Toombs' paper very timely.

because in most textbooks and clinics the rôle of infection in true preeclamptic toxemia is considered to have been so conclusively disproved that little or no attention is given to it, much to the possible detriment of prophylaxis and much to the loss of proper direction in presaging those cases in which, from my experience, preeclamptic toxemia is most likely to occur.

DR. PAUL TITUS, PITTSBURGH, PA.—I do not believe that focal infection plays any more of a rôle in these cases than merely acting as an occasional contributory cause of toxemia of pregnancy. The best proof we have of this is that many women who have profound toxemia of pregnancy have no evidence whatever of infection; the reverse also being true, that we see many women with focal infections in the teeth, tonsils and elsewhere who show no evidence of toxemia.

There is being brought to bear more and more proof almost daily that all toxemias of pregnancy are closely related to one another; that their underlying cause is a disturbance in metabolism. We have both metabolic and pathologic proof of these statements. For instance, the strongest argument probably that has been presented to bear out the idea that there is a dissociation between these states was the one that there are distinctive differences between the pathologic lesions in the liver in vomiting of pregnancy as contrasted with those of eclampsia. Nevertheless, various authorities and recently Acosta-Sisson have reported series of fatal eclamptic cases in which all types of lesions were to be found. Those lesions supposed to be typical of eclampsia were present in only a small portion of Acosta-Sisson's cases. We are likewise observing similar significant blood chemistry findings in the toxemias of late and of early pregnancy, with special evidence pointing to disturbances in carbohydrate metabolism.

DR. JAMES E. DAVIS, ANN ARBOR, MICH.—In cases of severe eclampsia where patients die and one has the complex pathologic picture of multiple hemorrhages or multiple necroses in the liver, in the kidney, in the myocardium, and around the ventricles of the brain, and the blood cultures show no infection, examinations for foci are without success, temperature remains normal, and the leucocytes are normal, toxemia must surely prevail. In other cases that recover you may find no rise of temperature, negative blood cultures, no rise in leucocytes and no signs of infection, but the next pregnancy shows a progressive nephritic pathology and an eclamptic condition. A number of these cases must be explained as occurring without infection.

DR. DAVID HADDEN, OAKLAND, CALIFORNIA.—When I started the practice of obstetrics I insisted upon each patient taking lime daily in some form for I believed that such a régime would save the teeth. A few years later I came upon an article written by a Frenchman who advanced the thought that the toxemias of pregnancy and eclampsia occurred because of a deficiency of lime. These two theories made me insistent that each patient take at least two tablespoonsful of limewater daily throughout the whole pregnancy. Under this régime I have seen albumin clear up in those patients who came to me in the later months of pregnancy. I have wondered if it was just a coincidence or if the lime had any significance.

I should like to see some of the members of this Association test out the adrenal cortex extract in eclampsia. Its use in exophthalmic goiter and in Parkinson's disease has given me some interesting results though its use in malignancy has shown only relief from pain. It without doubt produces a rapid elimination of muscle toxins.

DR. TOOMBS (closing).—It was not my purpose to convey the impression that it is my belief that all toxemias are due solely to infection, but to arouse in you an interest in the study of focal infections in relation to the etiology of toxemia.

THE OBSTETRICAL SOCIETY OF PHILADELPHIA

STATED MEETING, MAY 7, 1931

DR. JACOB H. VASTINE read a paper entitled **The Rôle of Roentgenology in Obstetrics**, in which he presented a general review of this subject.

DISCUSSION

DR. JOHN A. McGLINN.—An important matter is the routine examination of the chest of all infants before they are discharged from the hospital. I am absolutely convinced, from the number of cases I have seen, that the obstetrician has not fulfilled his whole duty if the thymus is not examined before the patient leaves the hospital, so that in the lateral view you may see whether there is pressure upon the trachea.

In a patient rather advanced in years, I did a section after she had had an unsuccessful attempt at labor, and got a living child perfectly formed. The x-ray showed no enlargement of the thymus. Three days later the child was reported dying: it was unquestionably a thymus case. The child was taken to the hospital, pictures were taken and treatment given immediately. Any number of cases of thymus deaths have come to my attention, which might have been avoided if the thymus had been examined before the patient left the hospital.

DR. LIDA STEWART COGILL reported a case of **Hydatidiform Mole With a Subsequent Negative Aschheim-Zondek Reaction**.

The anterior pituitary hormone in hydatid and chorionepithelioma is usually demonstrable for several months and when the urine gives a negative reaction we may assume that there is a cessation of chorion proliferation.

If this test proves to be as valuable a diagnostic and prognostic aid as Mack and Catherwood and other workers believe, it will mean the lessening of many needless operations in cases of hydatidiform mole and the giving to many patients another chance of having a fruitful pregnancy, provided, as stated by Sande, that hydatidiform mole has no effect upon subsequent fertility.

Mrs. B., aged twenty-six, gravida i, with strong maternal instinct and great desire for children, came to my office June 27, 1930 with the following history: She first menstruated at the age of twelve years, normally and regularly until four years later when she became anemic and had left inguinal pain after taking long hikes. No pelvic examination was ever made.

This pain continued up to time of her marriage in 1923. Four years later in 1927 menstruation became irregular and scanty, often going over a month, pain in left side continuing, this condition probably due to ovarian dysfunction from excess of anterior pituitary hormone. Last period April 17, 1930. Upon internal examination there was tenderness of left ovary with some enlargement, uterus corresponding in size to a two months' pregnancy.

Increase in size of uterus continued normally until September 12, when it gradually became smaller. Patient was never sure she had felt life. On November 7, 1930, she began having red discharge which continued for four days, never any amount of bleeding, some backache and feeling of weakness. She was sent into the maternity hospital and a mole was expelled with very little bleeding. The

patient complained of great weakness and faintness during uterine contractions, but made a very good recovery with the exception of large cystic ovaries which were exceedingly tender to touch.

No curettage was done after expulsion of hydatidiform mole, but two months later Dr. Charles Mazer did an Aschheim-Zondek test with a negative reaction.

DISCUSSION

DR. CHARLES MAZER.—The urine in cases of hydatidiform mole carries the anterior pituitary hormone in concentrated form so that the reaction in the infantile mouse ovaries can be obtained with one-fifth the quantity required in the diagnosis of normal pregnancy.

The Aschheim-Zondek test has a more important function in that diagnosis of chorionepithelioma may be made with a fair degree of certainty. The continued presence of anterior pituitary sex hormone two months after the expulsion of the mole may be regarded, according to the observations of most investigators, as evidence of the presence of chorionepithelioma. In the presence of clinical symptoms, a negative Aschheim-Zondek reaction should not be regarded as conclusive evidence against the presence of chorionepithelioma.

The disappearance of the Aschheim-Zondek reaction after extirpation of the uterus argues against the presence of metastasis. The test is therefore of great value both in the diagnosis and prognosis of chorionepithelioma.

DR. LIDA STEWART COGILL also reported a case of **Complete Spontaneous Rupture of Uterus in a Normal Breech Labor.**

Mrs. K., aged thirty, colored, gravida iv, para iii. Date of last menstruation and of quickening uncertain, probably due in November, 1928. Registered in prenatal clinic of Woman's College Hospital, May 29, 1928. Wassermann negative, cervical smear showed no evidence of gonorrhea, her previous three labors were normal.

Operation for right inguinal hernia in sixth month of this pregnancy, otherwise history negative. Entered hospital Jan. 6, 1928, stating she had slight pains for two days. Breech presentation, right sacral anterior position, cervix dilated $1\frac{1}{2}$ fingers, no obliteration, membranes unruptured, pains slight and irregular, fetal heart good. One and a half ounces of castor oil given at noon, quinine sulphate gr. x with strychnia sulphate gr. $\frac{1}{60}$, repeated quinine sulphate gr. x in $\frac{1}{2}$ hour. Pains became stronger, 4:30 P.M. membranes ruptured, breech on perineum at 4:45 P.M., patient having strong pains every three to five minutes.

Taken into delivery room at 4:50 P.M. and at 5 P.M. pains suddenly ceased and signs of ruptured uterus appeared, the baby was extracted, placenta found in abdominal cavity, very moderate external bleeding but signs of internal hemorrhage, vaginal packing was done and stimulating treatment administered, pulse rapid and irregular, baby was stillborn.

Patient sent to operating room, and upon opening abdomen the abdominal cavity was found filled with blood and clots. Rupture was found on the left side of uterus posterior to the broad ligament. The peritoneal coat was torn for a distance of 10 cm. above the cervix. The rupture was complete through all the coats of the uterus for a distance of 5 cm. and parallel with uterine artery. A panhysterectomy was done.

Microscopic examination showed a hyaline degeneration of the uterine muscles. Patient lived eighteen days, dying from septic pneumonia and peritonitis.

A complete spontaneous rupture of the uterus occurring during a normal labor is exceedingly rare and with history of previous normal labors one may not recognize the true condition at first. In this instance the physician who was supervising the case

with the intern did recognize what had occurred and at once started stimulating treatment and packed the vagina. The placenta was probably attached over the weakened area of the uterine wall and was expelled into the abdominal cavity. The breech remained fixed at outlet and was readily extracted.

DR. FAITH S. FETTERMAN presented a paper entitled **Referred Pain of Ureteral Origin.** (For original article see page 259.)

DISCUSSION

DR. FLOYD E. KEENE.—Several years ago, Mirabeau brought out the fact that dysmenorrhea not infrequently was of ureteral or renal origin, and I have seen several patients whose menstrual pain could undoubtedly be explained in this way.

I cannot emphasize too strongly the fact which Dr. Fetterman has brought out that one may easily confuse a lesion along the urinary tract with that of the pelvic organs, appendix, or gall bladder, and I am sure that many of us have been chagrined in removing a normal ovary or appendix when the lesion lay in the ureter or kidney.

This applies with particular emphasis in the diagnosis of the so-called chronic appendicitis. I never make this diagnosis until all other possibilities have been eliminated, particularly lesions of the ureter.

DR. H. M. GINSBERG.—I have always believed in the referred pain of the ureter. It has been our policy at the hospital to make a ureteral examination on all patients with obscure abdominal pain and if they also have pain radiating down the leg we feel sure that they have either a ureteritis or some form of obstruction in the ureter.

The fact that the symptoms of a ureteral stricture are often aggravated during the menses will often mislead. The exaggeration of symptoms is caused by the congestion of the pelvic organs at this time which naturally increases the degree of obstruction in the ureter.

As we make all our urograms by the pycloseopic method and are able to see the exact size of the ureter under the fluoroscope it would be interesting to inject pituitrin as suggested by the speaker and see what effect it has on a dilated ureter.

Department of Book Reviews

CONDUCTED BY ROBERT T. FRANK, M.D., NEW YORK

REVIEW OF NEW BOOKS

GYNECOLOGY

Since the death of Reifferscheid, co-author of the first edition, Stoeckel has brought out two revisions of his book on gynecology.¹ This, the third, edition bears evidence of a critical review of the literature of the past three years and includes much new material. The illustrations are beautifully done, the sixty-five colored prints are superb and the type is easily read; this is in marked contrast to the flimsy binding which makes the handling of a book weighing five pounds rather tiresome.

Stoeckel goes rather deeply into the psychic factors of such neuro-gynecologic disorders as vaginismus. There is a good chapter on diseases of the bladder, yet no mention is made of the type of ulcer described by Hunner. And while some conditions of the ureter are discussed in scattered places, no mention of stricture of the ureter or its importance in pelvic differential diagnosis is made. Ectopic pregnancy is omitted, Stoeckel stating that it is an obstetric problem. The technic of the Baldy operation is incorrectly illustrated, page 313; the round ligament should be drawn through the broad ligament below the utero-ovarian ligament. Baldy stated that this point in the technic assisted in correcting accompanying prolapse of the ovary in cases of retroflexion. A statement in the text, accompanying the illustration in question, says the deeper the round ligaments are approximated the more the uterus will be elevated and anteфлекed. Experience shows that the lower the round ligaments are approximated on the posterior surface of the uterus, the greater the tendency for the fundus to again retroflex over the too low sling.

The section of ovulation and menstruation has been changed greatly. Here is a full presentation of recent conceptions of the interrelationship of the endocrine glands. While the work of some American anatomists and physiologists is quoted, it is evident that the pioneer work of Philip Smith, on the hypophysis, has been overlooked.

Stoeckel prefers vaginal hysterectomy in cervical carcinoma. He subjects his cases when operable, to a preliminary radium treatment, does a widespread vaginal hysterectomy and follows up with intensive roentgen-ray cross-fire. The chapter on radiation therapy in gynecology has been written by F. v. Mikulicz-Radecki.

Sterility is discussed in the same chapter with operations for sterilization, and there is included in this chapter a detailed discussion of contraceptive measures. A short chapter on diseases of the breast is included in the volume. The text is concluded with a pharmacopoeia, relating to gynecology, with a surprisingly large number of biologicals. How many of these organ extracts Stoeckel has found potent is not, however, stated. The book is a foremost example of a single volume text on gynecology.

—Philip F. Williams.

¹*Lehrbuch der Gynäkologie*, Dritte, Neubearbeitete Auflage. Von Prof. Dr. W. Stoeckel. S. Hirzel, Leipzig, 1931.

Liepmann² has arranged in a series of fifteen lectures a wealth of practical gynecology, which he terms a gynecologic seminar. He is partial to this form of writing, having previously offered obstetrics, psychology in women, operative obstetrics and operative gynecology in the same manner. Here he has drawn on the abundance of clinical material at his command, selecting cases, as necessary, to illustrate such points as his years of experience have shown to be of signal importance to the practitioner.

The text begins with enlargements of the uterus, and in succeeding lectures, or chapters, takes up tumors, displacements, anomalies of menstruation, infections and social gynecology. Under anomalies of menstruation are grouped for convenience both extrauterine pregnancy and malignant newgrowths.

Two features stand out in the book. One is Liepmann's interest in the subject of psycho-organic interdependence in gynecology, on which he lays great stress. The other is the marked development of, and a broad-minded attitude toward, what he terms "Frauenkunde": in that, when studying and treating gynecologic patients, one must consider the whole of the body, the social relationships of her life and the pelvic organs not as a triad, but as a unity. This idea is developed throughout the book in hygiene of women, cancer prophylaxis, the abortion problem and the subject of birth control.

The interpolation of case histories and the frequent use of the personal pronoun lends an individual flavor to the text.

—Philip F. Williams.

OBSTETRICS

This report³ on the *Still-Births and Neo-Natal Deaths in India* is a compilation of several researches.

The first part of the book is a discussion in the findings in 200 autopsies on stillbirths and infants dying at, or soon after, birth, and the related conditions of the mothers, as syphilis and toxemia, the placenta, and the complications of labor. It may be mentioned in passing that 17 of the mothers of this series died.

Of particular interest is the fact that caste and religious barriers did not hinder the investigation to a greater extent and, again, the fact that in a country where tropical diseases predominated, only 10 per cent of the deaths could be attributed to these diseases *per se*.

Malaria seems to have had little effect. One is surprised at the amount of "pernicious anemia of pregnancy"; this is a different entity from true pernicious anemia of this country. One learns that 35 per cent of the maternal mortality of India is caused by this disease, yet it does not seem to be a large cause of the stillbirths reported.

The second part of the book is a résumé of an All-India hospital questionnaire on stillbirths and neonatal deaths. The statistics show that complications of labor and acute maternal causes rate much higher than in England, while the rate for syphilis is obviously an understatement.

The third part of the book on conclusions and suggested preventive measures outlines an extensive program for education as to prenatal care among women, and a study of the relationship of diet, poverty, and malnutrition to fetal deaths and a further investigation of tropical diseases in pregnancy. A program for further education of medical students and midwives, postgraduate study, and the use of hospitals as teaching centers is suggested.

—Philip F. Williams.

²*Das Gynäkologische Seminar. Praktische Gynäkologie mit besonderer Berücksichtigung der sozialen Frauenkunde. In 15 Vorlesungen. Von Dr. Wilhelm Liepmann. Urban & Schwarzenberg, Berlin and Wien, 1931.*

³*Still-Birth and Neo-Natal Death in India: a Preliminary Enquiry. The Lady Irwin Research Fund. The Countess of Dufferin's Fund Council. By Christine J. Thomson. New Delhi: The Countess of Dufferin's Fund Council, London, Messrs. H. K. Lewis & Co., Ltd., 1931.*

To the second edition of Liepmann's *Obstetric Course on the Phantom*⁴ a chapter on the Kielland forceps has been added. This book, with its excellent and simple illustrations, should prove of great value to the student and practitioner in acquiring technical facility. The author objects to the use of forceps for rotation. The treatise is detailed, admirably arranged, with a short, clear text.

—R. T. Frank.

RADIUM AND ROENTGEN RAYS

Jarcho, in Volume 13 of the Series of Monographic Atlases edited by Case, covers the subject of *Gynecological Roentgenology*.⁵ The object of the series is to afford postgraduate work to the roentgenologist. The historical background of pneumoperitoneum and the injection of iodized oil, as well as tubal insufflation are adequately discussed. According to Jarcho, roentgenologic methods in gynecology afford information only as to the presence or absence of calcified fibroids. He might have added dermoid cysts which can be diagnosed by this method.

The technic, diagnosis, indications and contraindications, as well as the value of pneumoperitoneum are fully taken up. That skill and experience are needed for this procedure is emphasized as it might otherwise be both painful and not free from danger.

The aspects of uterosalpingography are likewise discussed in detail. Jarcho seems extremely partial to this method although I have seen unpleasant results of both recent and later appearance including permanent chronic inflammatory changes in the tube, localized retained particles of oil, as well as the occurrence of pelvic abscess. It is possible to combine both pneumoperitoneum and uterine salpingography in special cases. The tubal insufflation with air, oxygen or carbon dioxide is likewise fully described. Physiologic observations obtained on the uterus and tubes by means of these methods have proved of interest. A fairly complete review of radiation therapy in gynecology is appended.

The book is beautifully gotten up, with excellent illustrations, many case histories as well as description of apparatus and technic, so that it should prove of great value to the radiologist and radiotherapist. A large bibliography concludes this monograph which is to be highly recommended for those interested in this special field of gynecology in which the author has a large and varied personal experience.

—R. T. Frank.

Volume V of *Ergebnisse der medizinischen Strahlenforschung*⁶ contains a large amount of material by numerous authors. The first subject discussed "Der Kaskadenmagen," by Regelsberger, manifests itself by a triad of symptoms including the roentgenologic picture, anacidity, and spastic obstipation. The condition is a vagotonic symptom.

Pansdorf next takes up "Experimental Roentgenologic Studies of the Small Intestine." Such studies were dependent on the introduction of the Rieder contrast meal. He finds that the combined fractional oral administration of the contrast fluid and filling of the last loop of the ileum by enema, aids in these studies. The coils of small intestine show a definite arrangement. They should

⁴*Der geburtshilfliche Phantomkurs.* By Dr. med. Wilhelm Liepmann, Zweite, vermehrte und verbesserte Auflage. Urban and Schwarzenberg, Berlin und Wien, 1931.

⁵*Gynecological Roentgenology. A Roentgen Atlas of the Female Generative Organs With Special Reference to Uterosalphingography and an Outline of Gynecology in Its Relations to Roentgenology With Case Histories and a Chapter on Radium Therapy.* By Julius Jarcho. *Annals of Roentgenology*. Vol. 13. Paul B. Hoeber, Inc., New York, 1931.

⁶*Ergebnisse der medizinischen Strahlenforschung (Röntgendiagnostik, Röntgen-, Radium- und Lichttherapie).* Herausgegeben von H. Holfelder, H. Holt-husen, O. Jüngling, H. Martius, H. R. Schinz. Band V. Verlag von Georg Thieme, Leipzig, 1931.

empty in five to seven and one-half hours. By this method the effect of drugs, the rate of fat absorption with jodipin emulsion can be worked out.

Risse deals with the physical principles of photochemistry (light and x-ray). The genetic effect shows that in every case mutations are produced by x-ray and radium rays. These effects may produce pathologic symptoms, for which reason he warns against raying of the ovaries in order to induce temporary sterilization. The effects on cell division are described. Rays of all wave lengths appear to cause changes and the mutation is dependent upon the dose. He discusses questions which have not yet been fully clarified, including the wave length to be employed. Impregnation of cells, for example seeds with heavy metals, before the radiating, increases the mutations obtained. The further studies deal with dosage, variation of the chromosomes obtained, as well as somatic changes. The fact that the offsprings of radiated individuals are normal is accounted for by the almost inexhaustible reserves of different hereditary factors.

Baensch has described the radiation therapy of hypophyseal tumors. The experienced clinician will place much importance on an exact x-ray picture of the sella as well as the eye findings. Roentgen therapy is indicated if we are not dealing with cysts, endotheliomata or teratomata. However, the exact diagnosis will in most instances not be possible. Should the visual fields show progressive shrinkage, operative decompression is indicated. The best results are obtained in eosinophilic adenoma (acromegaly). In suprasellar tumor (dystrophia adiposa genitalis), headache and visual disturbance are frequently ameliorated. From these results he deduces that before operation is practiced, radiotherapy should be tried in the majority of instances.

Hildebrandt takes up the question of the advisability of treating malignant struma with radiotherapy. His material consists of 46 cases. In Bern, 1.04 per cent of all autopsies showed this condition, and of all goiters, malignancy was noted in 1 out of 11. The material at the Radiumhemmet showed only 13.6 per cent of cures, lasting 5 years by means of radium. At the Mayo Clinic, radium combined with surgery, showed 31 per cent of cures.

Halberstaedter and Simons treat the subject of skin cancer. In their opinion practically every early case of skin cancer is curable by means of radiotherapy. In advanced cases radiotherapy frequently is the sole remedy which promises cure. For these reasons radiotherapy appears at present to be the method of choice. Of importance is early recognition of the condition, technically unexceptionable method, and systematic follow-up over several years. In other words, the cure of skin cancer at the moment is primarily a problem in recognition.

Schinz and Uehlinger describe the diagnosis, prognosis and therapy of primary tumors and cysts of the bones. According to the authors, these tumors not only have their favorite site of location and age incidence, but are characterized by distinct rate of growth, type of metastases and radiosensitivity. In consequence of these characters, the method of treatment and prognosis can be outlined with considerable certainty as exceptions are unusual. Prognosis is determined by the biology of the growth. American statistics show that cure of osteogenic sarcoma is poor no matter what method of treatment is employed. Primary radical treatment is contraindicated in osteodystrophia cystica juvenilis and in benign giant cell tumors.

Zwerg discusses radium surgery of cancer of the gastrointestinal tract, the female genitals and the breasts. Of the gynecologists, Wintz appears the only one who feels justified in using radiotherapy alone in even operable breast tumors. The author believes that surgery should be employed in operable cases unless special contraindications exist. The results with radiotherapy appear even more hopeless in gastrointestinal carcinoma. He therefore advises against the employment of any

but surgical measures except in carefully selected cases. A combination of surgery for the local insertion of radium needles in uterine cancer, is described. At present no uniform principles can be formulated in this field.

Friedrich and Schreiber, in the concluding contribution, discuss the principles underlying work with light divided by means of spectroscopic apparatus. The subject is too mathematical and technical to be described in this review.

On the whole, this volume contains an unusual number of important contributions, both for the radiotherapist and the general medical public.

—R. T. Frank.

ENDOCRINOLOGY

Zondek's monograph on the *Hormones of the Ovary and the Anterior Lobe of the Hypophysis*² includes all of his experimental work, both published and unpublished. The amount is stupendous. Practically all of his discoveries have stood the full test of time and repetition by others. The immense amount of material included cannot be reviewed in detail. Of especial importance are the implantation method, which he devised, and which put an almost microbiologic technic at the disposal of the investigator. He describes his method of preparing female sex hormone which he calls "folliculin."

An important portion of the book are the studies of the prepituitary hormone and its separation into what Zondek calls "Prolan A" and "Prolan B." Not all investigators are as yet willing to concur that these represent two distinct hormones although the most recent work is somewhat confirmatory of this conception. Innumerable experimental investigations have been performed covering rejuvenation, inhibition of ovulation, effects during pregnancy, hormonal sterilization, ovulation during pregnancy, and interruption of pregnancy. Studies on the concentration of both female sex hormone and prepituitary hormone during pregnancy have been made. Clinical investigations of so-called polyhormonal diseases are included. The clinical use of female sex hormone and Prolan are described. The concluding chapters deal with the Aschheim and Zondek test for pregnancy which has revolutionized our diagnostic methods.

No student of endocrinology, whether his interests are clinical or strictly biological, can afford to do without this unique monograph.

—R. T. Frank.

²*Die Hormone des Ovariums und des Hypophysenvorderlappens. Untersuchungen zur Biologie und Klinik der Weiblichen Genitalfunktion.* By Dr. Bernhard Zondek. Verlag von Julius Springer, Berlin. 1931.

Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Selected Abstracts

Physiology of Pregnancy

Ogino, K.: *Ovulation Time and Conception Time.* Zentrabl. f. Gynäk. 54: 464, 1930.

From material obtained in 118 laparotomies the author draws the following conclusions: the time of ovulation falls between the sixteenth and the twelfth day before the expected menses, and is independent of the length or irregularity of the menstrual cycle. It is incorrect to express the ovulation time in number of days after the beginning of the last menstruation.

Conception following intercourse is dependent on: time of ovulation, the length of time spermatozoa will live in the female genitals, and the length of time the ovum may be impregnated after ovulation. Various authors give the length of time sperm will survive in the female as four to eight days with the most acceptable figure as three days.

From case histories the author believes that the eight-day period which falls between the nineteenth and the twelfth days before the expected menstruation is the most fertile, that conception is seldom possible between the twenty-fourth to the twentieth days before the menses, and that it is impossible from the eleventh to the first day before the period.

WILLIAM F. MENGERT.

Sfameni, P.: *The Active or Vital Dilatation of the Uterus.* *Monitore Ostet. Ginec.* 1: 581, 1929.

Even at present the greatest majority of physicians believe in the old doctrine that the uterus during gestation enlarges as result of pressure exerted by the developing ovum within its cavity, that such passive distention becomes possible because of hypertrophy and hyperplasia of the uterine walls.

Over a century ago, Bertrandi and Meli have maintained that the uterine wall offers no resistance to the ovum and that consequently no active pressure is required for its distention. These same authors believed that the capability of active anatomic dilatation is acquired by the uterus only in pregnancy. Sfameni, however, thinks that this ability is present through all the various phases of uteroovarian functional activity, though the intensity of the individual vital phenomena varies, so that they are manifested only weakly in the nonpregnant but strongly in the pregnant phase of the cycle.

For the last twenty-five years the author has been convinced that the walls of the uterus may expand and thus transform its virtually only anatomic into a real cavity. This property, termed by him "active functional dilatation, or active diastole," has an important bearing on the phenomena of pregnancy, both in the normal and the abnormal conditions.

SYDNEY S. SCHOCHET.
JULIUS E. LACKNER.

Eufinger, H., et al.: The Reid Hunt Reaction in the Diagnosis of Pregnancy. Arch. f. Gynäk. 136: 12, 1929.

Mice treated with serum from pregnant women showed a definite increase in the acetonitrile resistance. As pregnancy progresses, the Reid Hunt reaction becomes more and more positive. Patients suffering from hyperemesis gravidarum show no variation from the normal but those who are suffering from eclampsia and the late toxemias of pregnancy show markedly increased values. Parallel examinations of the fetal and maternal blood show marked variations. The umbilical cord blood practically always gives normal values. The authors conclude from their studies that pregnancy is practically always accompanied by a definite hyperthyroidism.

RALPH A. REIS.

Dierks, K.: The Use of the Manoilloff Pregnancy Reaction. Monatschr. f. Geburtsh. u. Gynäk. 87: 285, 1931.

The author maintains that the Manoilloff reaction is too unreliable for the detection of pregnancy during the early months. From the fourth month on it is a helpful but uncertain aid. The serum of pregnant women yields a positive reaction in 99.5 per cent of all the cases and the reaction is positive until the ninth day of the puerperium. In the presence of neoplasms such as carcinoma and myomas, the test is positive in about two-thirds of the cases. In all gynecologic cases other than those with neoplasms the reaction is negative. The test is negative when applied to liquor amnii.

J. P. GREENHILL.

Nerson, H.: The Manoilloff Reaction for the Diagnosis of Pregnancy. Bull. de la Soc. d' Obst. et de Gynéc. 1: 105, 1931.

The author employed the Manoilloff test for the detection of pregnancy in a small series of pregnant and nonpregnant individuals. He comes to the conclusion that the test is absolutely unreliable.

J. P. GREENHILL.

Pfleiderer, A.: The Present Status of the Biologic Pregnancy Diagnosis and the Serologic Relationship between Parent and Child. Monatschr. f. Geburtsh. u. Gynäk. 88: 1, 1931.

According to Pfleiderer, in spite of the enormous amount of work done on the physiologic and pathologic changes in pregnant and nonpregnant individuals and the biologic and chemical relationships between parent and child, no specific test has yet been evolved which will directly prove the presence of a fetus. The Aschheim-Zondek test which establishes the presence of a hormone from the anterior lobe of the hypophysis, indirectly indicates the presence of a fetus. This is the most reliable test up to the present time and far more certain than all the other reactions which depend upon changes in the ferments, colloids, ions or metabolism.

The Zangemeister photometer test which aims at the demonstration of a direct serologic relationship between parent and child is not dependable. It is therefore useless for forensic purposes. Hence the determination of the blood groupings remain the only useful serologic method of determining the paternity of a child in suitable cases.

J. P. GREENHILL.

Lassen: Reliability of the Aschheim-Zondek Reaction. *Ugesk. f. laeger* 92: 953, 1930.

Of 198 normal pregnancies examined, 194 gave positive reactions; of 9 extra-uterine pregnancies, 7 gave positive reactions; 1 hydatid mole gave a positive reaction; and of 114 varying conditions in women who were not pregnant, only 1 gave a positive reaction. Following parturition, of 11 patients examined, 2 were negative after only two days and 1 was positive after ten days. The causes for failure to obtain a positive reaction in a small percentage of pregnant women is discussed in detail.

The author points out the disagreement voiced by investigators as to the stability of a solution of hypophyseal hormone and reports an experience of his own. A urine which gave a positive reaction was preserved at a temperature of 2-3° C. for 148 days. After that time, using the same amounts as in the first test, a reaction was obtained which was as strongly positive as the original one.

REUBEN L. LARSON.

Bourg, R.: A New Procedure in the Application of the Aschheim-Zondek Reaction. *Rev. franç. de gynéc. et d'obst.* 26: 65, 1931.

The experience of this author with the Aschheim-Zondek test leads him to recommend that the test be carried out at the same time on a male and female rat each about one month old. These animals are more certain, more constant and more resistant than mice. The test when positive in rats manifests itself macroscopically by the presence of false corpora lutea in the ovary in the females, and by hypertrophy of the seminal vesicles in the males. The latter are more sensitive than females hence they yield the most reliable reactions, and a macroscopic examination is sufficient in the males.

J. P. GREENHILL.

Fanz, J. I., and Gault, E. S.: Hydatidiform Mole as a Cause of Positive Reaction in the Aschheim-Zondek Pregnancy Test. *J. Lab. & Clin. Med.* 16: 27, 1930.

The authors report a case of hydatidiform mole which gave a positive Aschheim-Zondek pregnancy test reaction. Inasmuch as there was no fetus, but merely chorion and decidua, the pituitary hyperfunction can be attributed only to one or both of these cell proliferates. The decidual proliferate of the uterus can hardly be regarded a producer of hormones in the pituitary since it is maternal tissue from the start, but it is probable that the anterior lobe of the hypophysis acts as a co-secreting organ to the growing placental proliferate (possibly Langhans' layer).

W. B. SERBIN.

Schultze-Rhonhof, F.: Experiences With the Aschheim-Zondek Reaction, Especially in Hydatid Mole and Chorionepithelioma. *Zentralbl. f. Gynäk.* 54: 578, 1930.

The author points out the possibility of using the test as a diagnostic aid in pregnancies in which the question of intrauterine fetal death arises. As a positive test is not found more than eight to ten days after death of the fetus, a negative reaction is definite evidence of intrauterine fetal death. However, a positive test is not definite evidence that the fetus is alive.

The test is of great value as a criterion of the completeness of a cure of mole or chorionepithelioma after spontaneous expulsion or operative removal.

In conclusion, the author discusses the question whether the placenta stores or secretes the hormone. In view of the relatively enormous amounts of the hormone found in cases of chorionepithelioma in which condition there is only trophoblastic tissue and no pregnancy, he believes the placenta must play a secretory rôle.

WILLIAM F. MENGERT.

Ehrhardt, Karl: Chorionepithelioma and the Pregnancy Reaction. *Zentralbl. f. Gynäk.* 54: 1538, 1930.

The value of the Aschheim-Zondek reaction as a diagnostic aid in cases of chorionepithelioma is stressed in this article. A case of malignant chorionepithelioma with metastases in brain, lung, liver, both kidneys, spleen, and left ovary, was observed for a period of six weeks and at every trial a positive test obtained with injection of only 1/80th to 1/100th of one c.c. of urine. This is about one tenth the quantity required in a case of normal pregnancy.

WILLIAM F. MENGERT.

Fahlbusch, O.: The Aschheim-Zondek Reaction Used as Indication for Operation in Chorionepithelioma. *Zentralbl. f. Gynäk.* 54: 1542, 1930.

A twenty-five-year-old woman, in whom histologic study of uterine curettings justified suspicion of chorionepithelioma, was watched. The Aschheim-Zondek reaction was consistently negative over a period of six months. Curettage apparently had removed all of the tumor. This case proves the great practical value of the Aschheim-Zondek reaction in instances of suspected chorionepithelioma. In spite of the histologic findings the author felt justified in conserving the uterus on the basis of the negative outcome of the hormonal tests. He knew that an early diagnosis would be made in the event of a recurrence and operative procedures could then be instituted.

WILLIAM F. MENGERT.

Reeb, M.: The Importance of the Biologic Reaction of Pregnancy (Aschheim-Zondek) for the Diagnosis and Prognosis of Hydatidiform Mole and Chorionepithelioma. *Bull. de la Soc. d'obst. et de gynéc.* 1: 94, 1931.

Reeb maintains that 50 per cent of the cases of chorionepithelioma follow a hydatidiform mole, 25 per cent occur after an abortion and 25 per cent follow a normal pregnancy at term. He employed the Aschheim-Zondek test in two cases as an aid in the clinical and histologic diagnosis of malignancy. He urges that this test be employed in all doubtful cases. As a result of the use of this test many uteri which would otherwise be removed because of a suspicion of malignancy will be left undisturbed.

J. P. GREENHILL.

Ginglinger, A.: Early Diagnosis of a Chorionepithelioma by Means of the Aschheim-Zondek Reaction. *Bull. de la Soc. d'obst. et de gynéc.* 1: 99, 1931.

The author reports a case of chorionepithelioma which was recognized very early by means of the Aschheim-Zondek test. The patient passed a hydatidiform mole in April and on July 15 examination revealed everything to be normal. The patient had had a normal menstrual period from July 4th to 8th. An Aschheim-Zondek test was performed as a matter of principle, and it was found to be positive. There were three possibilities to account for this, namely, pregnancy, remains of the hydatidiform mole and a chorionepithelioma. A curettage was

performed on August 5 and a chorionepithelioma was discovered. The uterus was extirpated and the malignant tumor found. Two months after the operation, an Aschheim-Zondek test was negative.

J. P. GREENHILL.

Grier, G. W.: *The Value of a Lateral View in the Diagnosis of Pregnancy.* Radiology 14: 571, 1930.

The author emphasizes the importance of x-ray in pregnancy and also the advantages of both anteroposterior and lateral views. The advantages of the lateral view are as follows: Better detail due to the fact that there is less tissue to penetrate, particularly noticeable in twin pregnancies where the abdomen is quite large. Fetal bones can be demonstrated earlier in the lateral than they can in anteroposterior views.

The lateral views are of more value early in pregnancy while in the latter months of pregnancy after the fetal head has dropped into the pelvis the detail is obscured by overlapping bones and therefore the anteroposterior view is preferable. The relation of the size of the fetal head to the pelvis is better demonstrated in the anteroposterior view.

In the recognition of a dead fetus repeated examinations (both views) have been quite valuable as a cessation of increase in the size of fetus can be demonstrated. Monstrosities have been shown in either views.

HERMAN M. MEYER.

Gardner, J. A., and Gainsborough, H.: *The Cholesterol Metabolism During Pregnancy.* Lancet 216: 603, 1929.

Hypercholesterolemia has been reported in subacute parenchymatous nephritis, diabetes, cholelithiasis, arteriosclerosis, pregnancy and other conditions. Its normal value has been given as a definite figure by many investigators. The authors found that the normal cholesterol content of plasma varied between wide limits, but that in a given healthy individual the plasma cholesterol tends to remain at a fairly constant level. From this it was deduced that the degree of hypercholesterolemia in a pregnant woman could be definitely determined only when her previous normal rate was known.

The patients used in this study came to the clinic at the same hour, although it was impractical to obtain the blood in the "fasting" condition. Specimens were taken at monthly intervals before parturition and once or twice during the confinement.

The results showed: (1) An increase in the free cholesterol of the plasma during the first 30 weeks of pregnancy; concurrently an ester cholesterol decrease for the same period; (2) after the thirtieth week these curves both gradually approach a normal ratio before or near the parturition; (3) the values of plasma cholesterol are generally normal in the first two weeks of the puerperium; (4) some cases show a definite total hypercholesterolemia in which the total cholesterol figures run roughly parallel to the free cholesterol value.

The authors conclude that there is a marked disturbance in the cholesterol metabolism with great changes in the free and the ester cholesterol of the plasma, but with only moderate change in the total cholesterol. They suggest that such changes might be associated with the differentiation of the fetal tissues, and growth of the fetal brain, or that they possibly might be produced as a protective reaction for the mother.

H. C. HESSELTINE.

Malfatti and Burtscher: Changes in the Alkali Reserve of the Blood in Pregnancy, Labor and the Puerperium. *Arch. f. Gynäk.* 143: 272, 1930.

There is a definite decrease in the alkali reserve of the blood during pregnancy which becomes more marked during labor. This decrease is greater in primiparae than in multiparae. The alkali reserve increases during the first four days postpartum but does not reach normal values. Lactation again decreases the alkali reserve of the blood and twelve to twenty-one days postpartum the carbon dioxide combining power of the blood is not yet back to normal. Puerperal infections result in a decrease of the alkali reserve greater than average. Hyperemesis gravidarum and the kidney of pregnancy show an abnormal decrease in alkali reserve, i.e., more of a decrease than is normal for pregnancy in a healthy woman.

RALPH A. REIS.

Siedentopf and Eissner: Blood Reaction During Early Pregnancy and the Puerperium. *Ztschr. f. Geburtsh. u. Gynäk.* 97: 17, 1930.

In a previous paper the authors have shown conclusively that there is a decrease in the hydrogen-ion concentration of the blood during the last months of pregnancy. With that in mind, they examined the blood of 21 women during the early months of pregnancy, and 28 during the puerperium.

Their conclusions are: (1) Even early in pregnancy, there is a definite decrease in the hydrogen-ion content. (2) The same is true in the puerperium, but the P_H of the blood becomes normal five to eight days postpartum. (3) During labor there is an acidosis due to the muscular activity.

LESTER E. FRANKENTHAL, JR.

Bok, A.: The Ammonia Content of the Blood in Pregnancy, Its Source and Its Function as Controller of the Reaction of the Blood. *Arch. f. Gynäk.* 140: 11, 1930.

The ammonia present in the blood is known to control the neutrality of the blood and thus prevent hyperacidity or hyperalkalinity but there has never been available any precise method of measuring its concentration. Bok elaborating on the technic of Ellinghaus, studied 120 women throughout pregnancy. He finds that ammonia, as such, is found in the blood of healthy nonpregnant women, the average amount being 0.293 mg. per 100 c.c. of blood. During the first half of pregnancy, there is practically no change in concentration, the average present being 0.314 mg. During the second half of pregnancy there is a definite rise to 0.501 mg. There is a decrease postpartum but the amount present is still above normal on the fifth day, 0.347 mg. The ammonia was found to be markedly increased in the 8 cases of toxemia of pregnancy which were investigated (0.648) but was not higher in true eclampsia than in the other forms of toxemia.

In an effort to determine the source of the ammonia, samples of blood were drawn and allowed to stand twenty-four hours before being analyzed. The results then were much higher, normal controls being 2.023, first half of pregnancy 2.081, last half of pregnancy, 1.587, second stage of labor 1.707, puerperium 1.717, eclampsia 1.348. Apparently, therefore, the blood in late pregnancy, labor and the puerperium contains progressively less of the ammonia "mother substance."

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ENDOMETRIAL HYPERPLASIA AND CARCINOMA OF THE BODY OF THE UTERUS*

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ETIOLOGIC studies upon the glandular carcinomas of the body of the uterus have been few in comparison with the immense amount of work devoted to the cancer arising from the squamous epithelium of the cervix. As a result of the attention devoted to the latter, a group of lesions exhibiting signs of epithelial proliferation, such as erosion and leucoplakia, have been recognized as precancerous, at least to the extent that their treatment as a prophylactic measure is now enthusiastically recommended. For adenocarcinoma, however, no such theoretic or practical conclusions have been reached. The development of carcinoma from endometrial polyps has indeed been frequently reported but the existence of a relationship between cancer and endometrial hyperplasia, the disease which from analogy with similar conditions elsewhere might be regarded with immediate suspicion, has been denied by several writers.

Clinical experience with several striking cases in which the pathologic reports from a series of curettings from the same patient indicated an apparent transformation of hyperplasia to carcinoma led us at the Roosevelt Hospital to believe that the conclusions of these writers were perhaps premature. This opinion was strengthened by the finding in the literature of several similar cases and it was therefore decided to investigate the problem by a comprehensive survey of the clinical and pathologic material of the gynecological division relevant to the subject. For this

*Read by invitation at a meeting of the New York Obstetrical Society, May 12, 1931.
NOTE: For lack of space it is not possible to print Dr. Taylor's article in full. The complete paper is published in the author's reprints. The elided paragraphs are marked * * * *.—Editor.

NOTE: The Editor accepts no responsibility for the views and statements of authors as published in their "Original Communications."

purpose a review was undertaken of the adenocarcinomas of the corpus for twenty-one and a half years (Jan. 1, 1910 to July 1, 1931), of the benign endometrial hyperplasias for five years, and of the endometrial polyps for six years. The material studied comprised the following cases:

Hyperplasia of the endometrium	85
Endometrial polyps	50
Carcinoma of the corpus	152
Cases incorrectly diagnosed hyperplasia	128

I. EVIDENCE DERIVED FROM A STUDY OF CASES OF HYPERPLASIA OF THE ENDOMETRIUM

1. *The Problem of Correct Diagnosis of Glandular Hyperplasia.*—The work of reviewing the microscopic material had scarcely begun when it became clear that the problem, at least so far as the Roosevelt Hospital was concerned, depended upon the correction of diagnosis by the definition of the morphologic characteristics of glandular hyperplasia and its clear separation from physiologic forms of hypertrophy on the one hand and from early carcinoma on the other.

During the five-year period, 1925-1929, the diagnosis of hyperplasia or hypertrophy, or the apparently synonymous terms, hyperplastic or hypertrophic endometritis, were applied to 257 specimens of which, after extensive resectioning of material, 216 were available for satisfactory microscopic review. Of this number only 88 (from 85 patients) could probably be properly classed as glandular hyperplasia, the remainder being divided as follows: Normal premenstrual endometrium, 67; endometrium of the sixteenth to the twentieth day type, 19; endometrium of the early part of the interval, 19; endometrium of very early intra-uterine pregnancy or in association with an ectopic pregnancy, 11; endometrial polyps, 7; basal layer hyperplasia with functioning endometrium, 2; carcinoma, 3. The histologic study was made with constant reference to the clinical history and the revised diagnosis was corroborated in almost every instance by the data upon types and dates of menstrual periods.

In many of the discarded cases, the error in original classification was due merely to a loose employment of the term hyperplasia by its application to a special physiologic phase of the endometrium, whereas in a few instances there was evidence of actual failure to recognize the nature of the tissue under examination. This group of cases forms the basis for casting the first doubt upon the validity of some of the apparent transformations of hyperplasia to carcinoma, for it is probable that in many general hospitals, where the pathologic work is carried on by departments neither particularly versed nor interested in special gynecologic problems, the term endometrial hyperplasia has very little significance.

2. *Histologic Similarity of Endometrial Hyperplasia and Carcinoma.*—Shaw has written that he believes there is no relationship between

hyperplasia and carcinoma because he can see no histologic similarity of the endometrium in the two diseases. Meyer, on the other hand, has repeatedly emphasized that the morphologic distinction between hyperplasia and carcinoma is dependent upon differences of degree only and that there are cases which are practically transitional. Ewing writes in a similar vein that "in a series of cases [of hypertrophic endometritis] every gradation may be observed from normal glands to those of adenoma malignum."

The 85 cases in the present series may be collected into four ill-defined groups to illustrate this conception of a varying degree of hyperplasia which ultimately reaches a grade hardly distinguishable from the proliferative activity of a differentiated carcinoma. The relative frequency of each group is shown in Table I.

TABLE I. TYPES OF TREATMENT IN ENDOMETRIAL HYPERPLASIA

	HYSTER- ECTOMY	CURETTAGE AND RADIUM	CURETTAGE AND MYOMECTOMY	CURETTAGE AND OOPHORECTOMY	CURET- TAGE	TOTAL
1. Mild Hyperplasia	4	5	0	0	4	13
2. Moderate Hyperplasia	9	20	0	1	11	41
3. Marked Hyperplasia	7	13	1	1	3	25
4. Excessive Hyperplasia	3	2	0	0	1	6
Total	23	40	1	2	19	85

1. In the first type actual hyperplasia of the epithelium is very slight, the change from the normal consisting in the presence of a few cystic or distorted glands. Suggestions of cyclical activity may even be present, so that this group perhaps contains some uncertain cases.

2. The second group includes those with the typical "Swiss cheese" gland pattern with acini of varying size, lined by flattened or enboidal cells. Evidences of proliferation are here slight, the presence of cystic glands being still the chief feature. It might therefore be preferable to term these cases dysplasia, as Graves has suggested, were it not for the apparently unbroken transition of this variety into the ensuing ones.

3. To the third group also belong cases commonly recognized as glandular hyperplasia, but here in addition to the irregular cystic changes there occur acini in which the epithelium is no longer flattened but is composed of large, closely approximated, high cylindrical cells. Clusters of small gland sections appear scattered through the stroma, suggesting new formation and perhaps complicated branching of glands (Fig. 1). In these cases a more definite hyperplasia has been added to the "dysplasia" of the other types.

4. There are finally a few cases whose structure has many of the features of carcinoma. In these the glands are no longer truly cystic, although they may exhibit marked variations in size, some being small and round, others flattened, still others large and distorted (Fig. 2). The epithelial band bordering the acini is greatly thickened, the nuclei lying at different levels in the cells so that the appearance is given of a



Fig. 1.—Hyperplasia of the endometrium in a woman of forty-four after two months intermittent bleeding (photomicrograph $\times 45$).



Fig. 2.—Hyperplasia of the endometrium in a woman of forty-six after seven years of nearly constant bleeding (photomicrograph $\times 70$).

multilayered epithelium (Fig. 3). The nuclei themselves vary considerably, but they are sometimes large with dark granules and the distinct nucleolus which Broders has described as of significance in the recognition of malignancy (Fig. 4). A tendency to the formation of intra-glandular projections is present in certain cases (Figs. 2 and 5), and in others there are occasionally encountered suspicious areas of atypically staining epithelium (Fig. 5). In the latter, however, the possibility of a localized functional reaction, possibly an attempt at secretion, cannot be positively excluded. The cases of this fourth group are comparatively

rare but are of considerable importance in diagnosis and their easy confusion with carcinoma has led Heyman to question the accuracy of reported results in the treatment of cancer of the corpus unless the pathology has been carefully considered.



Fig. 3.—Hyperplasia of endometrium associated with fibrosarcoma of the ovary in a woman of fifty-five, with recurrent bleeding six years after the menopause (photomicrograph $\times 65$).



Fig. 4.—The epithelium in case of marked hyperplasia in woman of fifty-two (photomicrograph $\times 200$).

3. *Biologically Similar Properties of Hyperplasia and Carcinoma.*—In several respects the behavior of hyperplastic endometrial tissue is suggestive of that of carcinoma.

1. *Tendency to Invasion:* The observation has been made by several writers that in cases of hyperplasia the upper muscular layers are fre-

quently invaded by endometrial glands and stroma, constituting a condition termed adenomyosis. Shaw found this in all cases in which he had sections of the line of division between mucosa and muscle. Beckman reported adenomyosis interna in 6, a few penetrating glands in 7 and a sharp boundary in 7 of the 20 cases he studied. Novak and Martzloff noted adenomyomas in 8 of their 32 uteri in which there was hyperplasia of the mucosa.

In 19 of our cases sections were available for a study of the upper layers of the muscularis. In practically all, occasional glands were observable below the most superficial muscle fibers, while in 8 there were definite small islands and in 3 extensive areas of glandular tissue in the muscularis. The significance of these findings is perhaps not great, since a moderate degree of adenomyosis is almost the rule in women approach-

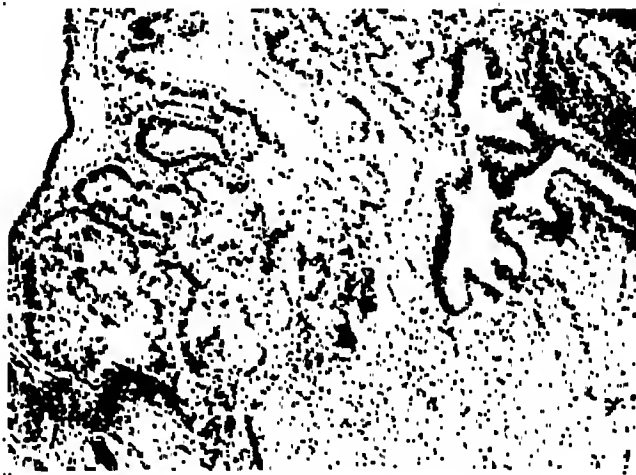


Fig. 5.—Areas of atypical staining reaction in same case as Fig. 4 (photomicrograph $\times 120$).

ing the climacteric (Meyer and Kitai). On the other hand, it is perhaps correct to regard the infiltrative capacity of these glands as the earliest foreshadowing of the invasive characteristics of carcinoma. It finds an analogy in the development of penetrating pegs of squamous epithelium described in leucoplakia of the cervix, the lesion alleged to be precancerous for that region (Hinselmann).

2. Tendency to Recur: It is well known furthermore that endometrial hyperplasia is frequently, perhaps as a rule, not cured by simple curettage, and when cures occur it is rarely in any except the milder cases. Fuss, for example, in a study of end-results, noted that among 17 mild cases, 13 were cured by curettage and 4 required x-ray afterwards, while among 14 moderate cases only 2 were successfully treated by curettage, and in 19 severe cases none were cured by curettage alone.

In the Roosevelt Clinic it is the custom to use moderate doses of radium very freely for bleeding in women over 40, and for that reason there are few cases to study in which the primary treatment has left much possi-

bility for further endometrial activity. The frequency of recurrence in 12 cases treated by curettage only and observed for periods of one to six years may, however, be stated as follows: Mild hyperplasia, cured 1, recurred 2; moderate hyperplasia, cured 1, recurred 3; marked hyperplasia, cured 1, recurred 3; hyperplasia with borderline histology, cured 1, recurred 0.

4. *Transformation of Hyperplasia to Carcinoma.*—The actual derivation of a malignant tumor from a supposed precancerous lesion is difficult to prove, and in most instances of such apparent evolution one is unable to exclude the possibility of a mere coincidence of the two conditions. Nevertheless presumptive evidence exists that an actual transformation has taken place when there is a change in the histologic character of the curettings obtained from the same patient at successive operations. This happening has been referred to casually as of more or less frequent occurrence by several writers (Koblanck, McCann), but the specific instances that have been reported are rare.

* * * * *

Extensive studies of the late results of treatment of hyperplasia have been made under the direction of Meyer in the University Clinic in Berlin, although here the aim has been frankly to test the efficiency of histologic diagnosis and not the possibility of carcinomatous evolution (Kaufmann and Hoeck, Mack, Fuss). Of special interest was a group of 24 cases of very marked hyperplasia in which there was a special fear of error (Hintze). None of the patients, whose subsequent history was traced, developed carcinoma, however, a fact indicative of careful original diagnosis as well as slight evidence against the malignant tendencies of hyperplasia.

Of the 85 cases originally diagnosed endometrial hyperplasia at the Roosevelt Hospital in the years 1925 to 1929, two later developed demonstrable carcinoma. On review both of these instances of apparent transformation were found to be due to original failures to detect the cancer. These cases were as follows:

CASE 1.—W. P. A. Gynecologic history, 14028, 15881. First admission, December 14, 1925. Aged seventy-two, married, three children. Menopause at forty. Chief complaint, sanguineous discharge, duration four weeks. Operation, dilatation and enrettage, insertion of radium, 50 mg. for ten hours. Gross findings, uterus normal size and position, curettings considerable in amount. Pathologic diagnosis, hyperplasia of the endometrium. Second admission, November 4, 1927. Chief complaint, discharge, one month duration. Operation, dilatation and curettage, complete abdominal hysterectomy, bilateral salpingo-oophorectomy. Gross pathology, uterus normal in size with two small papillary areas in the cavity. Pathologic diagnosis, adenocarcinoma, Grade I.

Study of the sections obtained from the first curettings confirmed the diagnosis of endometrial hyperplasia, but when new preparations were made from a deeper level in the paraffin block an island of papillary adenocarcinoma was discovered (Fig. 14).

CASE 2.—E. L. Gynecologic history, 13593, 15343, 19303. First admission, November 7, 1925. Aged fifty-seven, single. Present illness: menstruation in this patient had been frequent, profuse and prolonged during her fifty-first and fifty-second years, but had become infrequent at fifty-three and then ceased entirely until just before her admission. First operation, dilatation and curettage. Insertion of radium, 50 mg. for twelve hours. Gross findings, several small subserous fibroids, smooth cavity, curettings scant in amount. Pathologic diagnosis, hyperplasia of the endometrium. Second admission, May 20, 1927. Chief complaint, recurrence of bleeding, beginning about one year after the first operation. Second operation, dilatation and curettage, insertion of radium, 50 mg. for eighteen hours. Gross findings, uterus still slightly large and a little irregular, curettings moderate in amount. Pathologic diagnosis, hyperplasia of the endometrium. Third admission, June 24, 1930. Chief complaint, recurrence of bleeding at the age of sixty-three after a freedom from symptoms for three years. Third operation, complete abdominal hysterectomy, bilateral salpingo-oophorectomy. Gross pathology, uterus moderately enlarged, with small fibroids, the en-



Fig. 6.—Hyperplastic glands in an endometrial polyp, associated with diffuse hyperplasia, in a woman of fifty-five, six years after the menopause (photomicrograph $\times 70$).

tire cavity having a granular appearance. Pathologic diagnosis, adenocarcinoma, Grade I.

The sections obtained from the uterus after the final operation show a typical differentiated adenocarcinoma. The histology of the earlier curettings was essentially the same, the diagnosis of hyperplasia being an error made possible by the minuteness of the fragment in one instance and to poor staining in the other.

These two cases, which had afforded the original impetus to this study, illustrate the practical dangers of a confusion of hyperplasia and carcinoma due to a failure of the malignant parts of the endometrium to reach the microscope or to an erroneous interpretation of morphology. They emphasize furthermore the criticism that must be applied to cases of apparent evolution of carcinoma from hyperplasia.

5. *Relation of Endometrial Polyps to Hyperplasia and to Carcinoma of the Endometrium.*—Study of 50 cases of endometrial polyps treated in the years 1925-1930 brought out the already recognized relationship which exists between these growths and endometrial hyperplasia. In the

first place an associated generalized mucosal hyperplasia was found to be present in a third of the 18 cases of polyp in which the endometrium proper could be properly examined. Secondly, from a structural standpoint, it was noted that in 33 of these polyps the gland pattern was essentially that found in the diffuse disease and exhibited the same variations in degree of hyperplasia, from specimens made up of apparently inactive dilated cysts to others composed of closely packed, hypertrophied glands with small areas suggestive of active proliferation (Fig. 6).

No definite cancer was present in any of these cases, but the occurrence of carcinoma in endometrial polyps has been reported so many times that the malignant potentialities of these growths must be regarded as fairly well established (Stone, Stacy, Cooke, La Monica, Dannreuther). On account of the points of similarity, particularly those of structure, between these circumscribed and the generalized forms of endometrial hyperplasia, it seems logical to expect that carcinoma should at times arise on the basis of the diffuse hyperplasia also.

II. EVIDENCE OF ORIGIN FROM HYPERPLASIA IN A SERIES OF CASES OF CORPUS CARCINOMA

The review of the late results in a series of treated cases of hyperplasia has revealed little evidence of a tendency to the development of malignancy. Two possible objections to conclusions arrived at by this method of study may, however, be cited, one being that the interval of observation has been too short, the other that the cases were so thoroughly treated that possible potentialities for malignant change were adequately controlled. The approach to the problem from the opposite direction by a search of the histories of a series of cases of already existent carcinoma for evidence of a previous benign endometrial lesion and the pathologic material for evidence of coexistent hyperplasia has yielded many instances suggestive of a relationship.

A. EVIDENCE OF PREVIOUS HYPERPLASIA FROM THE HISTORY

Of the entire group of 152 cases of corpus carcinoma, there were only 128 in which any record of previous history was on file, so that percentages of frequency must be based on this number. In studying these cases particular attention was given to two points, first the history of an earlier curettage and, secondly the occurrence of metrorrhagia at the time of the menopause when irregular uterine hemorrhage is due in many cases to endometrial hyperplasia.

1. *History of Previous Curettage.*—Twenty-five patients (19 per cent) had been curetted at least once, prior to their admission for their carcinoma operation, for conditions other than miscarriage.

a. Six patients were curetted within a year before their admission. Carcinoma was probably present at the time of the first procedure in all

of these, although in one case successive pathologic reports show an apparent change of a benign to a malignant neoplasm.

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b. Seven patients gave a history of curettage from one to four years before their final operation, this interval being long enough to indicate that cancer was either not present or else not discovered by the first operator.

W. P. A. The patient already cited as Case 1, who was curetted at the Roosevelt Hospital two years prior to her hysterectomy for carcinoma, the area of cancer having been missed originally by the microtome.

E. L. The patient already cited as Case 2, who was twice curetted at the Roosevelt Hospital before the nature of the tissue was correctly evaluated.

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It is certain that carcinoma was present in two and probably in the third of these cases at the time of the first operation. They illustrate the



Fig. 7.—Endometrium in a patient of forty-four, five years before operation for carcinoma. Cystic area (photomicrograph $\times 70$).

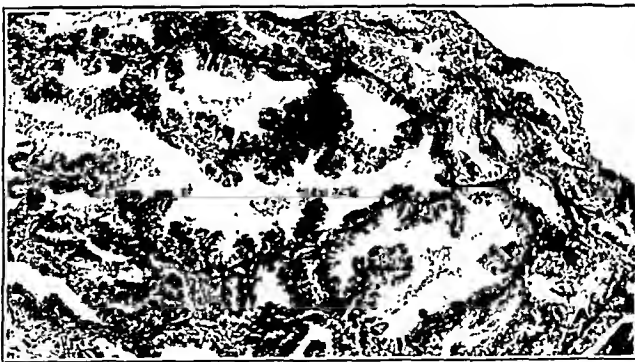


Fig. 8.—Endometrium in same case as Fig. 7. Papillary area (photomicrograph $\times 70$).

danger of inaccurate diagnosis as a result of incomplete curettage, incomplete sectioning, or bad pathologic judgment.

e. Four cases were curetted in the period between five and ten years before the operation for carcinoma. This interval makes it possible that in each case the earlier operation was performed for a benign condition

and in the first instance to be reported pathologic sections of tissue obtained at the earlier operation are still available for study.

CASE 5.—H. P. Gynecologic history, 19101. Admitted May 1, 1931. Aged forty-nine, married twenty-three years, no pregnancies. Chief complaint, irregular bleeding and continuous sanguineous discharge for twelve months. Previous history: five years ago the patient was curetted for brownish discharge by Dr. Herbert Thoms of New Haven, to whom I owe the privilege of publishing microphotographs of his original sections (Figs. 7 and 8). The pathologic diagnosis made in 1926 was symmetrical hyperplasia of the endometrium. Following this curettage the periods were normal until the onset of the present illness. Operation June 1, 1931, curettage and radium as a preliminary to hysterectomy. Gross pathology, the uterus slightly enlarged, the cavity containing a considerable quantity of friable tissue. Microscopic diagnosis, adenocarcinoma, Grade I.

Microscopic description: The curettings from the earlier operation show an endometrium of varying microscopic structure. In one region there are dilated glands of irregular shape lined by a single layer of large columnar cells (Fig. 6), while in other areas (Fig. 7) the glands have a papillary structure suggestive of a premenstrual endometrium. In comparison with the normal endometrium of the secretory phase, however, the cells of this papillary epithelium are large, with prominent nuclei, almost centrally placed, and a more deeply staining cytoplasm. Nucleoli are present in some of the cells but no mitotic figures. The tissue is certainly not an example of the classical glandular cystic hyperplasia although small areas with the structure of that disease are present. These earlier curettings apparently represent nevertheless an hyperplasia of some type, possibly an excessive degree of physiologic hypertrophy (Lahm, Adler, Meyer), possibly a kind of diffuse papillary adenoma. The sections obtained at the patient's second operation are those of a typical, rather highly differentiated papillary adenocarcinoma.

In a second case there is on record a pathologic diagnosis of hyperplastic endometritis made upon curettings obtained five years before the final operation for fundus carcinoma. No tissue or preparations have been preserved, however, and the extent of the growth at the final operation suggests an error in the earlier diagnosis.

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In the remaining two cases no pathologic diagnosis could be obtained from the earlier operation. The extensive character of the neoplasm when these patients finally came to hysterectomy indicates again that cancer may well have been present at the time of the first operations although such an explanation requires the supposition of a surprisingly slow rate of growth.

* * * * *

d. Four cases were curetted over ten years before the operation for carcinoma. The first of these is apparently a clear example of the development of adenocarcinoma sixteen years after a curettage for endometrial hyperplasia. The diagnosis of hyperplasia is established by the detailed record of the type of bleeding, by the pathologic diagnosis and description and by the finding of a cyst in one ovary at celiotomy. That the cancer was a relatively late development is indicated by the scanty

menstruation and periods of amenorrhea which followed the early conservative operations.

CASE 9.—H. S. Gynecologic history, 3096, 3298, 17761. Admitted, November 23, 1929. Aged forty-five, married, no children. Early menses normal, 28 by 3 days, worse. Previous history: the patient began when very young, to have menstrual difficulties and at the age of twenty-seven consulted Dr. Howard Taylor, Sr., on account of irregular, chiefly too frequent periods, and sterility. A curettage was performed at the Roosevelt Hospital on May 20, 1913, and a pathologic diagnosis of "chronic hyperplastic endometritis" made with the following description: "The endometrium shows a small round-cell infiltration. The glandular epithelium is somewhat hyperplastic, tending in places to heap up into several layers and the lumina of the glands are distorted and often dilated." A few months later the right tube and ovary were removed on account of an ovarian cyst, 8 cm. in diameter. During the next sixteen years, the patient was under observation at long intervals, her history showing that her periods were regular in 1915 (aged thirty-one), scant in 1917 (aged thirty-three), scant with months of amenorrhea in 1918 (aged thirty-four), profuse and of ten to twelve days' duration but at intervals of three to four months in 1923 (aged thirty-nine). The patient was then lost sight of until just before her present admission when she reported that her menses had remained irregular but not too profuse until the last few months when frequency and amount had increased. Operation (November 23, 1929), complete abdominal hysterectomy, salpingo-oophorectomy, left. Gross pathology: uterus, 9 by 6 by 4 cm. with its cavity lined by a shaggy growth extending from the fundus into the cervix. The left ovary contained a cystadenoma, serous in type, 12.0 cm. in diameter. Diagnosis, adenocarcinoma, Grade II.

In two other cases the nature of the original condition is less firmly established, but the type of symptoms, occurring at the menopause, makes it probable that in these also antecedent hyperplasia was present. The rather unusual types of malignant tumor later developing are, however, to be noted.

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The final case in this subgroup, however, weakens somewhat the conclusions drawn from the other three since here the course of the malignant disease impeded only by a curettage lasted over sixteen years.

CASE 12.—M. T. Gynecologic history, 4352, 18610. Admitted, October 18, 1930. Aged sixty-one, single. Chief complaint, irregular bleeding for three months. At the age of forty-five, this patient was curetted at the Roosevelt Hospital for metrorrhagia. The pathologic diagnosis was adenomatous papilloma of the uterine mucosa but the note was added that such a type of growth, although not malignant, might become so. Sixteen years later there was found an extensive growth of the lower half of the uterus with the histologic structure of an adenocarcinoma, Grade II.

The sections from the curettage of 1914 are still available for study and show what would now be regarded as a differentiated type of adenocarcinoma. It is of course not clear whether cancer was continuously present in this uterus over a period of sixteen years or a new focus developed shortly before the return of symptoms.

e. Four cases were curetted early in life. These operations were performed under circumstances suggestive only of an abnormally developed

reproductive system or more specifically of some ovarian or endometrial disorder. In these patients (Cases 13 to 16, Gynecologic histories 14009, 16199, 16389, 17235), the operations had been performed, all before the age of thirty-five, for membranous dysmenorrhea, excessively painful menstruation, menorrhagia, and amenorrhea, respectively.

2. *History of Previous Nonoperative Treatment of Symptoms Suggestive of Endometrial Hyperplasia.*—Of the 128 cases of corpus carcinoma there were, beside the group that had had previous curettage, five cases which had been under medical observation for uterine bleeding at a time sufficiently remote from that of the operation for carcinoma to make it doubtful that a malignant tumor was then present.

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3. *Previous History of Adenomatous Polyps of the Cervix.*—It is interesting to note that of the 128 cases of corpus carcinoma, 11 gave histories of the removal of cervical polyps at some time prior to their final admission for cancer. The interval between the dates of treatment of the two lesions was from two weeks to two months in 4 cases, from six months to one year in 4 cases, eighteen months in 2 cases, seven years in one case, twenty years in one case. The polyps were not available for study to determine whether they were endometrial or endocervical in type, a point of some theoretical importance in considering their possible relationship to the endometrial carcinoma. From a practical standpoint, however, it is clear that the avulsion of a polyp with the omission of curettage is not an entirely safe procedure since valuable time was obviously lost in several of these cases as a result of the casual assumption that the polyp was the sole cause of bleeding.

B. THE ASSOCIATION OF HYPERPLASIA AND CARCINOMA IN THE SAME UTERUS

The morphology of the uninvolved endometrium in cases of corpus carcinoma has been little studied and what descriptions exist are extraordinarily conflicting. The controversy on this subject dates back at least to the writings of Gebhard at the close of the century and Maunu af Heurlin in 1911, both of whom held firm although completely conflicting views of the relation of "endometritis glandularis" to carcinoma. More modern work upon the problem has been largely limited to the reporting of special cases. Of greatest interest is a group of five cases described by Meyer, in which he demonstrated the fine morphologic line between hyperplasia and carcinoma and the occurrence of islands of cancer in areas of hyperplastic endometrium. The development of carcinoma in the hypertrophied glands overlying the most prominent points of submucous myomas has been noted in 3 cases by Ewing and in one by Doca, although it is not certain that this apparently localized hypertrophy is to be regarded as identical with the entity now known as glandular hyper-

plasia. There can, however, be little doubt of the association of hyperplasia and carcinoma in the cases noted by Schröder, by Adler and by Fluhmann and Stephenson. Yet Novak and Martzloff, in their paper on hyperplasia, have stated that "hyperplasia cannot be regarded as predisposing to cancerous growth" and Fluhmann and Stephenson consider their case of association as a mere coincidence since after a review of 22 other cases of carcinoma of the body no further evidence of hyperplasia could be found. This statement may be misleading, however, since the character of the endometrium in these 22 cases is not stated and it is not clear in how many uninvolved endometrium was present for examination.

The pathologic material for this study consisted of the filed microscopic sections of 130 and the gross specimens of 8 cases of corpus carcinoma. This material, when classified as in Table II on the basis of availability for microscopic examination of sections of endometrium uninvaded by cancer, rapidly dwindled so that only 11 cases were wholly satisfactory and 23 more partly so.

In regard to the condition of the endometrium in the fifteen cases with sections of only a little true mucosa (2a), no conclusive statements can be made. Nevertheless it appears that in 6 cases these glands were probably normal or atrophic, in 2 cystic, in 4 possibly hyperplastic and in 3 it is not clear whether certain groups of well formed glands are to be regarded as hyperplastic or as merely relatively differentiated areas of the carcinomatous process.

TABLE II. AVAILABILITY OF SECTIONS OF NONMALIGNANT ENDOMETRIUM IN CARCINOMA OF CORPUS CASES

1. Cases without sections of uninvolved mucosa	104
a. Advanced cases with entire cavity invaded	62
b. Cases treated by curettage or biopsy only	12
c. Cases previously irradiated	9
d. Mucosa present in gross but not sectioned	21
2. Cases with small areas of endometrial glands	23
a. Cases with a little true mucosa	15
b. Cases with nonmalignant glands in polyps	2
c. Cases with nonmalignant glands in areas of adenomyosis	6
3. Cases with adequate endometrial sections	11

In two cases the only nonmalignant glands were localized in a polyp (2b). One of these polyps was uninvolved by carcinoma and must be considered an associated lesion, while in the other, cancer was present and had perhaps originated within the benign tumor. Reference has already been made to Stacy's finding of carcinoma in a polypus in 25 cases or 7.5 per cent of her series of fundus carcinomas.

Finally there were six cases in which the only nonmalignant mucosa remaining was that buried as islands of glands and endometrial stroma in the upper muscle layers. To these six must be added three more cases (Nos. 22, 26, 29) to be described below, in which intramuscular glands were present in addition to superficial areas of benign endometrium

(Figs. 9, 13). The presence of this adenomyosis in association with cancer has a distinct bearing on the subject since the invasive tendencies of these basal glands must be regarded as the manifestation of a hyperplastic process.

The eleven cases in which sections could be obtained with relatively large areas of noncancerous mucosa may be divided into the three following groups: (1) Those in which the associated mucosa was that of a normally functioning endometrium. (2) Those in which the mucosa showed evidence of hyperplasia and the women were of an age in which this disease is prevalent. (3) Those in which changes suggestive of hyperplasia were present in older women.



Fig. 9.—Adenocarcinoma of corpus with adenomyosis in the functioning endometrium of a woman of forty years (photomicrograph $\times 70$).

1. *Carcinoma in a Functioning Mucosa.*—In two cases carcinoma occurred in a uterus with an essentially normal endometrium whose structure agreed with the day of the cycle as computed from the date of the last period. Both of these cases were very early ones and in neither had intermenstrual bleeding occurred. Yet in the first case, in spite of the evidence of normal function, there was present a rather marked degree of adenomyosis of the upper muscularis (Fig. 9). In the second no sections were available of the mucosal muscular boundary.

* * * * *

2. *Carcinoma Associated with Hyperplasia in Women at the Menopause.*—In five cases of endometrial carcinoma occurring in women between the ages of forty-three and fifty-two there were evidences of benign hyperplasia in the uninvolved areas of mucosa. In two (Cases 26 and 28) the hyperplasia was of the rather typical cystic type, in two (Cases 24 and 29) the hyperplastic glands were very active, with irregularity in gland shape and in one (Case 25) the only remaining non-malignant mucosa consisted in a very hyperplastic basal layer. The prob-

ability that these cases illustrate a development of carcinoma on the basis of a hyperplasia is heightened by the clinical point that the increased bleeding was in each case preceded by a longer or shorter period of lengthened interval in the menstrual cycle and perhaps also by the presence of cystic ovaries in three of the cases.

CASE 24.—V. N. Gynecologic history, 7015. Admitted, May 27, 1917. Aged forty-three, married, one child. Original menstruation, 27 by 4. Present illness: menses began to occur every four to six weeks two years ago but for last seven months there has been intermenstrual bleeding also. Operation, dilatation and curettage, complete abdominal hysterectomy, bilateral salpingo-oophorectomy. Gross pathology, double uterine cavity with no fibroids, the carcinoma having been superficial and apparently all curetted away. Normal tubes. Cystic ovaries.

Microscopic description: the slide with the tumor was somewhat faded but showed an adenocarcinoma, apparently well differentiated. The areas of non-malignant mucosa were composed of an edematous stroma with widely separated



Fig. 10.—Superficial papillary adenocarcinoma overlying dilated and hyperplastic basal glands in a patient of forty-three years (photomicrograph $\times 60$).

glands which were irregular in size and shape, for the most part large and sometimes cystic and lined by closely approximated nonsecreting cylindrical cells.

CASE 25.—A. K. Gynecologic history, 11563. Admitted, September 26, 1922. Aged forty-three, married, four children. Original menses occurred every three to four months. Menopause at forty-one. Present illness: slight bleeding began six months ago and has recurred every three to four weeks. Operation, dilatation and curettage, complete abdominal hysterectomy, salpingo-oophorectomy, bilateral. Gross pathology, uterus normal size with a fungating growth beginning at the internal os and occupying the whole of the lower half of the corpus and partially invading the wall. Normal tubes. Cystic ovaries.

Microscopic description: the tumor was a papillary adenocarcinoma, Grade II. One section showed clearly a layer of basal endometrial glands beneath a narrow strip of superficial papillary carcinoma. The basal glands showed cystic dilatation and great irregularity of size and shape. Their cells were large and cylindrical but distinctly different in type from those of the carcinoma (Fig. 10).

CASE 26.—C. U. Gynecologic history, 13212, 14431. Admitted, December 2, 1924. Aged fifty-one, married, two children. Original menses, 28 by 5. Previous opera-

tion, partial amputation of cervix for tuberculosis in 1910. Present illness: in 1919 when the patient was forty-six a fibroid was noted on a routine examination. Her periods were regular until 1921 when they occurred at two to three months intervals and were very scant. This type of irregularity was replaced by too frequent menstruation in 1922 but in the following two years the intervals were stretched out to as much as four months. Shortly before admission a continuous sanguineous discharge commenced. Operation, December 4, 1924, complete abdominal hysterectomy, bilateral salpingo-oophorectomy. Gross pathology, uterus

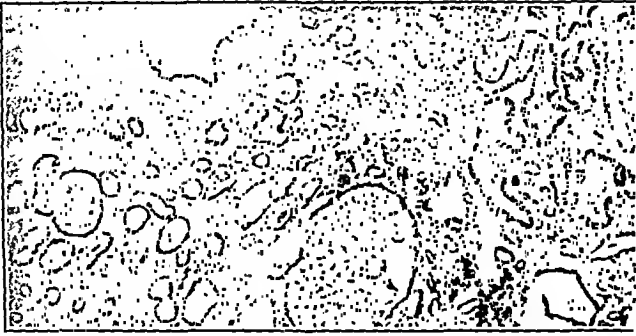


Fig. 11.—Adenocarcinoma adjacent to glandular cystic hyperplasia in a patient of fifty-one years (photomicrograph $\times 40$).



Fig. 12.—Papillary adenocarcinoma apparently arising from a hyperplastic endometrium in a patient of fifty-one years (photomicrograph $\times 40$).

enlarged by about thirty fibroids, varying in size from 0.8 to 8.0 cm. in diameter. The adnexa showed numerous old adhesions, possibly the result of tuberculosis. In the lower uterine cavity there was a thickening of the endometrium and numerous polyps in the cervical canal. Microscopic diagnosis, chronic cystic endometritis, multiple fibromyomas, cervical polyps, bilateral chronic salpingitis and oophoritis. Subsequent course: a papillary growth developed in the vaginal vault two years later, a biopsy of which showed a typical adenocarcinoma, Grade II, endometrial in type.

Microscopic description: the sections on which the original diagnosis of chronic cystic endometritis was made had not been kept, due to the benign diagnosis. New

sections from the preserved paraffin blocks revealed an absolutely typical glandular cystic hyperplasia with in places large dilated glands lined by a flattened epithelium and in other regions numerous small, round and oval glands with large closely packed cylindrical cells. Beneath the superficial layers of muscle were islands of stroma and glands showing the same hyperplastic changes. Adjacent to the zone of hyperplastic mucosa was a region of definite carcinoma with malignant glands occupying the greater part of the thickness of the endometrium but separated from the uninvaded muscularis by a thin rim of flattened normal glands. The later recurrence of the carcinoma corroborates this diagnosis of malignancy (Fig. 11).

CASE 27.—E. C. Gynecologic history, 16116. Admitted, February 24, 1928. Aged fifty-one, unmarried. Original menses, every twenty-one days. Present illness: six years ago periods stopped for six months and then returned to recur at two- to three-week intervals ever since, with great variation in duration and volume. Operation, complete abdominal hysterectomy, salpingo-oophorectomy, bilateral. Gross pathology: uterus enlarged by fibromyomas to measure 15 by



Fig. 13.—Hyperplasia of the endometrium with adenomyosis in a section remote from the carcinoma in a patient of fifty-two (photomicrograph $\times 60$).

12 cm. with almost the entire cavity shaggy with papillary growth. Serosus cyst of left ovary. Diagnosis, adenocarcinoma, Grades I and II.

Microscopic description: one section cut through the margin of the growth showed a relatively narrow strip of endometrium with its surface epithelium largely intact, containing many small glands and a few irregular-shaped dilated acini lined by an epithelium of one or two layers of high cylindrical glands. The appearance is not exactly that of the common cystic type of hyperplasia, but conforms with the description given of the more active types (Fig. 12).

CASE 28.—H. H. Gynecologic history, 17326. Admitted, May 26, 1929. Aged fifty-two, married, one child. Original menses, 28 by 5. Present illness: for seven years the patient's periods have been irregular, occurring every three to six months. For seven months there has been frequent scant bleeding. Operation: complete abdominal hysterectomy, salpingo-oophorectomy bilateral. Gross pathology: a uterus with several fibroids forming a mass the size of a grapefruit and in the cavity a "growth at one point near the fundus." Atrophic ovaries. Microscopic diagnosis, adenocarcinoma, Grade II.

Microscopic description: the sections of the malignant tumor were those of an adenocarcinoma, Grade II. Entirely separate sections showed a narrow strip of mucosa, composed of dilated glands, flattened, with their long axes parallel to the surface. Other glands were small and lined by large columnar cells, while still others were definitely cystic (Fig. 13).

3. *Carcinoma Associated With Apparent Hyperplasia in Women Over Sixty.*—Four cases of carcinoma in older women were found associated with proliferative changes in the endometrium of a less definite character than those just described. In one (Case 27) the hyperplastic features are chiefly cystic dilatation in the mucosa with endometrial islands in the



Fig. 14.—Adjacent islands of tissue obtained by curettage showing papillary carcinoma and hyperplastic glands in a patient of seventy-two (photomicrograph $\times 60$).



Fig. 15.—Hyperplastic glands in the fibrous stroma of the uterine mucosa of a woman of seventy-five with carcinoma of the corpus (photomicrograph $\times 80$).

muscularis. In another (Case 31) there is a definite noncystic hyperplasia of the glands well beyond the apparent margins of the cancer, but perhaps these active acini should be regarded as merely the relatively differentiated beginnings of the carcinomatous process itself. The remaining two (Cases 28 and 30) with their greatly dilated cystic glands are morphologically similar to the more typical glandular cystic hyperplasias of the menopause era.

The atrophic condition of the ovaries in these elderly women makes it possible that the endometrial activity has here a different origin than that of the classical hyperplasia of the premenopausal era. In this re-

spect Hofbauer's experiments on the relation of the anterior pituitary to endometrial hyperplasia offer an opportunity at least for speculation. It is likewise possible, however, that the endometrial abnormalities in these older women are but remnants of a typical hyperplasia persistent since the menopause.

V. A. Gynecologic history, 14028, 15881. Admitted December 4, 1925, and November 4, 1927. Aged seventy-two and seventy-four. The clinical data on this patient have already been given as Case 1.

Microscopic description: As has been noted, a small area of papillary adenocarcinoma was found upon recutting the sections of the tissue diagnosed in 1925

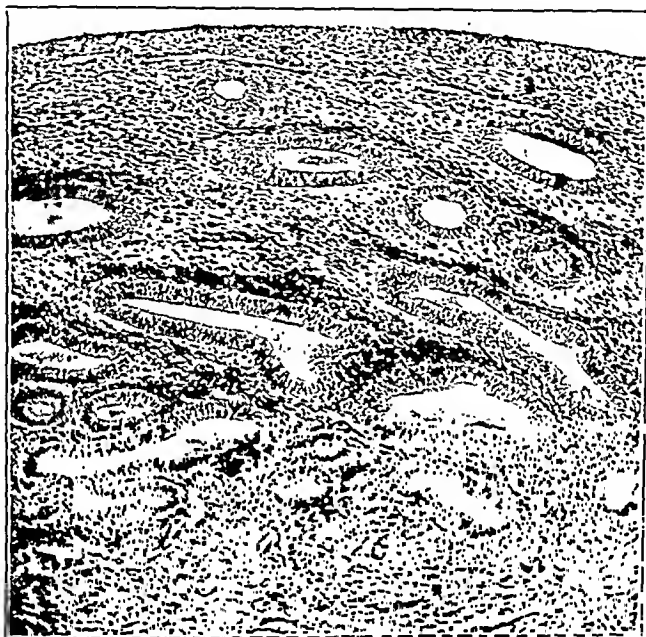


Fig. 16.—Section through the endometrium, 5 mm. from the margin of a papillary adenocarcinoma of the corpus in a patient of sixty-seven years (photomicrograph $\times 80$).

only as hyperplasia. The nonmalignant areas of endometrium from that year showed a stroma very fibrous in character containing numerous immensely dilated glands. The epithelium of the glands was high columnar, with oval nuclei crowded close together, apparently forming in some places more than one layer (Fig. 14). The tissue of two years later showed a similar dense stroma and even larger acini with irregular wavy contours adjacent to patches of infiltrating carcinoma. The ovaries were recorded as being atrophic.

CASE 29.—M. S. Gynecologic history, 16207, 16722. Admitted, October 28, 1928. Aged sixty-four, married, at least one child. Menopause at fifty-three. Present illness: the patient noted a little vaginal bleeding eight years ago and again six months ago. Following the latter attack a cervical polyp was removed but bleeding has continued. Operation, complete abdominal hysterectomy, salpingo-oophorectomy bilateral. Gross pathology: uterus enlarged by numerous fibroids with a small walnut-sized growth in the cavity at the fundus. Diagnosis, adenocarcinoma, Grade I.

Microscopic description: The endometrium was narrow and somewhat atrophic, with here and there immense very thin-walled cysts. Associated with the cysts were

clusters of flattened glands which in places dip down into the muscle tissue and in several areas form islands of glands and stroma in the myometrium.

CASE 30.—J. K. Gynecologic history, 17443. Admitted, September 5, 1929. Aged seventy-five, married, eight children, menopause at forty-three. Present illness: for four years the patient has suffered from irregular bleeding with the amount gradually increasing. Operation, dilatation and curettage, supravaginal hysterectomy, bilateral salpingo-oophorectomy. Gross pathology, uterus two and one-half times normal size, soft and boggy, with one intramural fibroid and a large submucous polypoid tumor. Ovaries, small and fibrotic. Diagnosis, adenocarcinoma, Grade II.

Microscopic description: The uninvolved endometrium is very similar to that noted in Case 29 with a fibrous stroma and immense dilated glands, some lined by a flattened, apparently atrophic epithelium, others by high columnar cells. Besides cystic acini there are smaller tubules, some in clusters, others single and irregular or tortuous in shape (Fig. 15).

CASE 31.—W. H. C. Gynecologic history, 18951. Admitted, March 19, 1931. Aged sixty-seven, married, one child. Menopause at fifty-two. Present illness: a cervical polyp was excised one year ago but irregular bleeding recurred eight months ago and has continued. Operation, dilatation and curettage, complete abdominal hysterectomy, salpingo-oophorectomy bilateral. Gross pathology, uterus slightly enlarged with growth filling the upper half of the cavity. Ovaries atrophic. Diagnosis, adenocarcinoma, Grade II.

Microscopic description: One section included a small segment of the tumor, which was a papillary adenocarcinoma, and a larger area of uninvolved mucosa. The endometrium immediately adjoining the base of the tumor was atrophic, possibly from pressure, but further away it widened out to form a definite though somewhat narrow strip just above the myometrium. The glands were perfectly regular except for a few in the basal layer which showed slight invaginations. The epithelium was high columnar with definite multiplication in some places of the cell layers. The individual cells were, however, smaller and more cylindrical and the cell boundaries more distinct than in the areas of carcinoma (Fig. 16).

C. ETIOLOGIC POINTS OF DIFFERENCE AND SIMILARITY

A few points in the etiology of hyperplasia and carcinoma rest on a basis sufficiently firm to demand their consideration in studying any suggested relationship between the two diseases.

* * * * *

SUMMARY

The relationship of hyperplasia to carcinoma of the endometrium has therefore an etiologic and a clinical aspect.

I. Etiologic relationship: The position of endometrial hyperplasia as a precancerous lesion rests upon the following evidence:

1. Morphologic similarity: The weight given such evidence is largely dependent upon individual conception of form and is not susceptible to direct proof. A review of 85 cases of endometrial hyperplasia suggests, however, that this entity consists in reality of a series of types varying from those which differ little from normal endometrium to others which closely resemble certain differentiated carcinomas.

2. Biologic similarity. The frequent association of endometrial hyperplasia with adenomyosis or the invasion of the muscularis by mucosal tissue and the tendency of the disease to return after curettage are perhaps to be interpreted as representations in miniature of two of the chief properties of malignancy, infiltration and recurrence.

3. Transformation of hyperplasia into carcinoma, as indicated by a change in the character of the tissue obtained in successive curettings in the same patient, has been reported in the literature in at least six instances. Such cases must, however, be regarded critically because of the frequent lack of precision in the use of the term hyperplasia and the possibility that undetected carcinoma may have been present in the uterus at the time of the first operation. The only two instances occurring among 85 cases treated for hyperplasia of the endometrium at the Roosevelt Hospital from 1925 to 1929 of apparent transformation to carcinoma were dependent upon such errors.

A review of 122 histories in cases of corpus carcinoma brings out the fact, however, that very many of these women had at some time before their final operation for cancer been under treatment for abnormal uterine bleeding. These cases may be divided as follows:

a. Cases in which endometrial hyperplasia almost certainly preceded carcinoma (Cases 5, 9).

b. Cases in which the time and characteristics of the previous bleeding make it probable that a period of benign endometrial disease preceded the development of the malignant tumor (Cases 10, 11, 18, 20).

c. Cases in which the earlier condition was obviously regarded by the clinician or pathologist as benign but which subsequent events indicate was very likely malignant (Cases 3, 4, 6, 7, 8, 17, 19, 21).

d. Cases in which the earlier bleeding was later definitely proved to be due to an unrecognized malignant growth (Cases 1, 2, 12).

4. The association of diffuse endometrial hyperplasia and carcinoma in the same uterus has been reported by previous observers and was noted in five instances (Cases 24, 25, 26, 27, 28) in the present cancer series. Similar proliferative changes were observed in 4 cases (Cases 1, 29, 30, 31) in women over sixty, in which, on account of the patient's age the unqualified use of the term endometrial hyperplasia has been withheld. In two further instances the carcinoma occurred with hyperplastic glands which were probably a part of an adenomatous polyp. Finally there were 9 cases of carcinoma associated with areas of invasion of the superficial muscularis by benign glands, constituting a condition termed adenomyosis and indicating abnormal properties in the basal endometrial glands.

Although in a total of 152 cases there were only 15 with definite histologic evidence of an associated hyperplastic condition of some type, one cannot speak in terms of percentages, since it is obvious that many cases are so advanced that possible benign preexistent lesions have been completely displaced by carcinoma.

II. Clinical relationship. Several cases in this series indicate that even with thoughtful handling, endometrial cancer may be mistaken for a benign condition. These cases lead to the following more or less obvious conclusions:

1. Postmenopausal bleeding from the uterine canal even if limited to a single attack should always be treated by curettage. No period of observation is sufficient to give security because further clinical evidence of carcinoma may not appear for even ten years after such an attack (Cases 17, 18, 19).

2. Curetted material, no matter how scant, may be carcinomatous, and it is never justifiable to dispense with microscopic examination (Case 7).

3. An incomplete curettage is not satisfactory as a diagnostic measure, for a small carcinoma may be missed by the instrument.

4. A single microscopic section of curettings is not sufficient to rule out cancer in suspicious cases because the microtome may not cut the particle containing the growth (Cases 1 and 26).

5. The histologic differentiation of hyperplasia from certain types of carcinoma requires at times considerable experience and the examination of multiple sections. The possibility of errors in diagnosis is very real and mistakes may lead to disastrous results (Cases 2, 12, and possibly 3, 4, and 6).

Whether from a practical standpoint hyperplasia is to be regarded as precancerous and treated as such must remain an open question. The relative frequency of hyperplasia undoubtedly indicates that the individual patient with the disease is reasonably safe. Nevertheless it appears that when the hyperplasia is at all marked, the possibility of a predisposition to the development of cancer should be considered and the case regarded with the same degree of suspicion now bestowed upon the diffuse forms of hyperplasia of the breast epithelium. In patients of the menopause age and older an adequate dose of radium is particularly indicated, certainly as the most efficient method of controlling bleeding, possibly as a prophylactic measure against the development of cancer.

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20 WEST FIFTY-THIRD STREET

(For discussion, see page 439.)

THE TREATMENT OF CARCINOMA OF THE CERVIX BY VAGINAL HYSTERECTOMY AND RADIUM*

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I DESIRE to present herewith an account of my methods of treatment for cancer of the cervix. The discussion of this subject of therapy seems to me vital for two reasons: (1) The incidence of collum carcinoma has in the last five years shown a remarkable increase. Cancer is unlike that common malady, tuberculosis, which in the past few years has decidedly decreased. Cancer mortality has increased so decidedly that, because of these figures, we must consider carcinoma as a widespread malady. (2) Another cause, which in my opinion makes cancer a theme worthy of discussion, is that we are apparently at the turning point in its treatment.

TABLE I. FEMALE MORTALITY STATISTICS IN VIENNA*

DIED IN THE YEAR	1924	1925	1926	1927	1928	1929
Lung Tuberculosis	1446	1299	1249	1256	1113	1074
Malignant Tumors	1625	1721	1811	1907	1903	1997
From this malignant tumor group: cancer of the female sex organs	425	438	471	521	535	548

*Number of deaths from Tuberculosis decreasing, from Cancer increasing.

Of all the cases of the female sex organs about 75 per cent are cancers of the cervix uteri.

At the beginning of this century the Wertheim abdominal cancer operation was in universal use, and the vaginal cancer operation previously in use was almost completely abandoned. The Schauta Clinic alone adhered to the vaginal carcinoma operation, which we attempted to extend and to make more radical. The reason for our fidelity to the vagi-

*Read by invitation at the Forty-fourth annual meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, White Sulphur Springs, W. Va., September 14-16, 1931.

nal radical operation was the enormous mortality of the laparotomy which we had not to fear with the vaginal procedure. This enormous death rate on the one hand, coupled with the relatively unsatisfactory permanent cure on the other hand, was the reason which induced a number of gynecologists shortly before the War to abandon the operation and to treat carcinoma of the uterus with radiation only. Originating with the French this method was first recommended by Krönig and Döderlein.

The results of the radium treatment were at first much worse than those of the operation. This was not sufficient to divert the adherents of the radiation therapy, for they maintained, and rightly so, that the technic of radiation was as yet not fully developed and that one could not fairly compare its results with those of the highly advanced surgical procedures. In the year following the War, the western countries, chiefly France (Regaud-Monod), Belgium, England and particularly America, devoted themselves to the nonsurgical treatment of carcinoma of the cervix. On the other hand, prominent men in Germany, Austria, Spain, and Poland have again upheld the vaginal radical operation. Thus, we have at our disposal today three different methods of cancer treatment: (1) laparotomy, (2) vaginal operation, and (3) radiation. All three methods after a test period of from fifteen to twenty years have by now outgrown their infancy and are at such a height of development that they permit a satisfactory comparison. Only on the basis of this comparison will the conscientious investigator be able to decide which method of cervix carcinoma treatment he should employ.

Before we take up the details of this comparison, it seems necessary to state clearly certain fundamental rules of cancer statistics. We gynecologists have agreed that before we call a case of carcinoma cured, at least five years must have elapsed since the end of treatment (either operative or radiation therapy). If the patient lives five years free from recurrence, then we speak of a "permanent cure." Among the permanently cured, we differentiate between "relative" and "absolute" cures and we form the relative percentage by comparing the number cured after five years with the number of the operated. For instance, if Operator A has operated upon ten women and, if after five years, four of these patients will live he has a relative cure percentage of 40. If Operator B has operated upon ten women of whom eight still live, he has a relative cure percentage of 80. These figures seem at first sight to show that Operator B has a more successful operative result than Operator A. This conclusion would, however, be reliable only if both operators had the same indications, that is, if both had the same operability. Therefore, in order to make possible a comparison of the relative cures, every operator must declare his percentage of operability, otherwise one can not make deductions from the conception of the relative cure. To retain the same example, if Operator A in his indication for operation goes so far as to operate upon ten women out of twenty, his relative cure of 40 per cent actually implies a much greater accomplish-

ment than that of Operator B, who only dares to operate upon the early cases and, for example, operates upon only ten out of 100 cases, although the relative cure of Operator A amounts to 40 per cent and that of Operator B to 80 per cent.

To be independent from the subjectivity of the indication and thus to establish a really reliable means of estimating the worth of a method, an absolute cure must be understood to mean that number which indicates how many out of a hundred women (including both operable and inoperable cases) are still alive and free of recurrence after five years. According to this principle the absolute accomplishment of Operator A amounts to 4 out of 20, which is 20 per cent, and that of Operator B amounts to 8 out of 100, which is only 8 per cent. It actually shows that Operator A, whose operative cure percentage amounts to 40, has more than the double result of Operator B, in spite of the fact that Operator B's relative cure percentage amounts to 80.

A further idea which is very decisive in establishing the worth of an operative method is that of the primary death rate or operative mortality, that is, the percentage of women who die from the operation or its consequences. It is clear that with an equal number of permanent cures I shall give preference to that method of operation where I have to consider a smaller mortality.

TECHNIC OF VAGINAL OPERATION

Before comparing the results, I want to demonstrate briefly our technic of the extended vaginal operation. We begin with the excoehleation and eauterization of the ulcerated tumor which is sometimes done the day before the operation. This is important because the danger of infection is lessened. The operation is commenced with a circular cut in the middle or lower part of the vagina, sometimes at the entrance according to the extension of the newgrowth. The mucous membrane is then dissected up as a cuff which is closed by thick silk sutures to exclude the newgrowth from the field of operation and from the wounds in the cellular tissue. A deep paravaginal (Schnelhardt) incision, which cuts the levator ani, is then made. The bladder is next dissected from the cervix, first in the middle, then laterally, after which the most important part of the operation, namely, the dissection of the ureters is systematically performed. Great care has to be taken especially in cases of carcinomatous infiltration of the parametrium. After the dissection of the ureters, the uterine arteries are ligated. By pulling forward the uterine vessels with a provisional ligature, it is possible to place the ligature around the artery outside the ureter. In some cases the ureter is so involved in the growth that it can not be separated and so has to be resected. In these cases I have at once implanted the ureter into the bladder by the vagina, but the final results are not very satisfactory: most of these patients die after a few years, of recurrence. After the dissection of the ureters and bladder they can be pushed off with a retractor so that the parametrium is visible in its total extension. The rectum is then dissected from the cervix, and the pouch of Douglas is opened. The parametrium is next extirpated, first the sacrouterine ligament. This ligament is pulled forward with strong forceps and cut clear at the pelvic wall. The arteria hemorrhoidalis is then clamped with forceps. After the posterior parametrium has been incised, the lateral parametrium is pulled forward

and out at the pelvic wall. At this part of the operation, the dissected ureter is always seen and is pushed back with the retractor, and the rest of the parametrium close to the uterine arteries is extirpated. As the uterine vessels have been previously ligated, there is very little hemorrhage. Therefore, there is no need for ligature or clamp and the parametrium is cut freely. This is of great importance, because it allows the whole parametrium to be removed without leaving a stump which might contain carcinoma cells. The same procedure is used on the other side. It is astonishing how a parametrium seemingly absolutely stiff and rigid from infiltration becomes movable during the operation. The anterior plica of the peritoneum is now opened and the uterus hangs on the round ligaments and adnexa only, which I always extirpate. The uterus is removed in the usual way at this stage. The peritoneum is closed, the stump of the infundibulopelvic ligament being pulled out and fixed with a suture so that all stumps are placed extraperitoneally. When doing this it is necessary to remember the situation of the ureter because it can be caught with the last stitch. This is the technic which has been used in the last 800 cases though sometimes modified in details according to the particular conditions of the case.

* * * * *

I have been scrupulously careful in compiling my statistics. All patients who died within the observation period of five years from intercurrent diseases are counted as recurrences unless the autopsy report stated un-

TABLE II. REPORT OF 1000 CASES OF EXTENDED VAGINAL OPERATION*

YEARS	OPERABILITY	DIED FROM OPERATION
	52.79%	6.1 %
1901-1906	47.5 %	11.37%
1906-1911	55.45%	6.4 %
1911-1916	53.26%	4.34%
1916-1921	51.55%	3.51%
1921-1927	61.7 %	3.88%

*All Wertheim cases are counted as inoperable.

TABLE III. FIVE YEAR CURES*

YEARS	OF THE OPERATED (RELATIVE)	OF ALL CASES (ABSOLUTE)
1901-1906	35 %	16.6%
1906-1911	37.89%	20.4 %
1911-1916	43.3 %	22.5 %+
1916-1921	43.0 %	21.99%
1921-1927	50.0 %	31.8 %++

*The laparotomies and untraced cases are considered as recurrences.

+, Radiations after operation began. ++, Almost all radiated after operation.

questionably that no carcinoma recurrence was to be found. Also, all patients who were not available after five years, the so-called "lost track of" patients, are considered as recurrences. Likewise in this table of statistics, the aim of which is to show the capacity of the vaginal operation, all cases are counted as recurrences in which for one reason or another the laparotomy instead of the vaginal operation was performed.

Before comparing the results of the abdominal and vaginal cancer operations I want to show you the progress in the outcome of the first 1000 cases of vaginal operation (the total number will be about 1200 now). Table II shows that the operability varies from 47.5 per cent to 61.7 per cent; the primary mortality being about 11.5 per cent in the first cases, gradually going down to 3.8 per cent, with an average of 6 per cent in 1000 cases (3.6 per cent in the last fifteen years). The relative cure percentage varies from 35 per cent to 50 per cent, and the permanent cure percentage from 16.6 per cent to 31.8 per cent.

Comparing now the results of the leading operators by the abdominal route (Wertheim and Bonney) for the last fifteen years we see that the vaginal operation with almost the same, and an even somewhat larger,

TABLE IV. RESULTS OF RADICAL OPERATIONS DURING THE LAST FIFTEEN YEARS

	ABDOMINAL		VAGINAL
	WERTHEIM	BONNEY	SCHAUTA
Operability	51.1 %	63.0 %	57.05%
Died of operation	16.0 %	16.6 %	3.85%
Five year cures of the operated (relat. cures)	39.2 %	39.63 %	41.7 %
Five year cures of all cases (absol. cures)	18.56%	25.00%	21.63%

TABLE V. RESULTS FOLLOWING TREATMENT OF CANCER OF THE CERVIX, WITH PERMANENT (FIVE YEAR) CURES

RADIATION			OPERATION		
WORLD LITERATURE (FRANQUE)	CASES 6827	ABSOLUTE CURES 17.45 %	WORLD LITERATURE (HEYMAN)	CASES 5816	ABSOLUTE CURES 19.1 %
Döderlein	1319	15.4% (18.2%)	Wertheim (Lap.)	1000 500	18.56% 20.0 %
Wintz	740	18.9%	Bonney (Lap.)	265	25.0 %
Forsell-Heyman	502	23.3%	Franz (Lap.) (2 years)	?	28.3 %
Regaud	222	16.6%	Schauta (vaginal oper.)	698 253	19.8 % 22.5 %
Bowing-Fricke	1094	21.8% (23.0%)			
George Gray Ward	134	23.6%			

operability has a permanent cure of about 22 per cent. It involves a much smaller primary operative mortality inasmuch as on the average nearly four times as many women die after laparotomy than after our vaginal operation. (Table IV.)

If we compare now the results of operation with those of radiation therapy we have at our disposal large series of statistics. Döderlein figured out of a series of 1,319 cases a permanent cure percentage of 15.4 per cent and even by excluding the cases which were exposed to radium treatment only once, 18.2 per cent. Regaud, of the Paris Radium Institute, has an absolute cure rate of 16.6 per cent; Wintz with roentgen rays has an absolute cure of 21 per cent; Voltz figures from world literature for radium therapy rate of 17.4 per cent; Heyman, of the Radiumhemmet in Stockholm, figures from the world literature an absolute cure in surgical treatment of 19.1 per cent, and in the case of radiologic treatment in the Radiumhemmet of 23.6 per cent (Strahlentherapie, 39: 1930). This master is modest enough to say that with a properly executed radiologic treatment of carcinoma of the cervix one can have at least as good results as with operation. Herein lies, according to my opinion, a particular stress on the little word "proper," because the properly performed radium therapy is at least as difficult to learn as the operation itself. (Table V.)

The objective comparison of the figures from the world literature shows that the results of the radium therapy perhaps in the hands of an expert will be as good as the results of an operation, but in no case will they exceed the results of the operation. If we consider that the unsatisfactory results where the only reason why operation was abandoned and radiation tried, we must confess, that radiation has not advanced us any further in our fight against cancer than operation has done. In radiation we have a second means of attack against cancer, but no better.

Naturally this does not imply any underestimate of the men who have had the courage to give up the cancer operation and to replace it with radium therapy. Neither does it imply an underestimate of the very extraordinary success of radiation therapy, but it challenges us to search for other methods to improve our results.

If we consider operation first then we must endeavor to increase the number of permanent cures through greater radicalism. We attempted this in the Schauta Clinic, and we were so radical that the operability for a time was increased from 50 per cent to 78 per cent. The expected success was not forthcoming. We had the same experience that others subsequently had; with the increasing radicalism the danger of the operation and the mortality increased, likewise the number of recurrences increased but the permanent cures did not grow. That is the reason why I am in agreement with those who claim, that we can not improve the permanent cures by radicalism or by extending the indications for operation.

Where the lever must be applied to improve the results, we know ex-

actly. The statistics of both methods of treatment, operation and radiation, shows that in early selected cases we can save nearly 90 out of 100 cases and that the results become worse the further advanced the case.

The point is to diagnose the cancer and to institute treatment as early as possible.

An operator who does not close his eyes to the extraordinary accomplishment of radiation therapy, must feel strongly impelled to utilize radiation for his operated cases, in order to improve his operative results by combining operation with radiation. My efforts in this direction began in 1913, and I have pursued them since that time, as I believe, with success.

Two methods seem theoretically possible and both have already been practically proved:

1. The preoperative radiation of carcinoma.
2. The postoperative, so-called, prophylactic radiation.

The chief advantage of preoperative radiation lies in the lessening of the primary operative mortality, an advantage which is of the greatest importance for the adherents of the dangerous laparotomy. It is of much less importance for the men who perform the vaginal operation, because this operation has only a very small death rate. A disadvantage of the preoperative radiation, which is admitted by some of its adherents, is that the technic of the operation is more difficult on account of changes in the tissue caused by the rays. Personally, I have had but little experience with the preoperative radiation. In the few cases in which I operated after radiation, I always had to face greater technical difficulties and the only unintended injuries of the ureter in the last fifteen years occurred in those cases which were radiated before the operation. Aside from this there exist no reports of permanent cures in preoperatively radiated cases.

A third, and as I believe, an essential point which speaks against the preoperative radiation is that the primary success of radiation and its apparent result is often so great that the patient becomes free of symptoms, considers herself cured, no longer permits an operation, and in many cases declines any further treatment. That this danger of the too early termination of treatment actually exists and is not merely a theoretical coincidence is shown not only by my experience but admitted by all radiation experts. The momentary successes are so extraordinary that practically a third of the patients withdraw themselves prematurely from the treatment.

These then, are briefly the reasons why I do not practice radiation before operation as a routine measure. Occasionally I radiate cases which seem inoperable and do the operation later when the uterus has become movable. This I have done especially in cases where the microscopic report has shown the existence of still living carcinoma cells in cases seemingly cured by radiation.

On the other hand, I systematically use the second method, the post-

operative, so-called prophylactic, radiation, and I may assert that I was the first who employed radium for postradiation, while a number of others (Gauss) almost at the same time began the prophylactic post-radiation with roentgen rays.

I used radium for postradiation for the first time in 1913 in two far advanced cases, which by chance I operated upon on two succeeding days. In both patients I was obliged to cut the parametrium in the middle of the cancer infiltration, so that the operation certainly was not radical. The idea occurred to me during the operation, to apply immediately a radium tube in the place where I had to leave carcinoma. Naturally I thought these two cases lost. To my great astonishment, however, I found both women free of recurrence after three years. As to the definite outcome of both cases I cannot say anything because during the War I lost track of them. Since then, I have worked incessantly on the problem of postoperative radiation. I next radiated only patients in whom I was not sure whether I had operated radically. In 1915 I began to radiate all operated cases with radium and roentgen rays. The results of my endeavors are shown in Table II. These results were reached by various methods. First I began with relatively large radium doses about three weeks after operation. The radiation was repeated in intervals of four weeks. The outcome was a noticeable improvement of the results; about 55 per cent of the operated cases remained permanently cured (relative cures) against 42 per cent of those not postoperatively radiated. But we found with this method repeated cases of fistulae. This induced us in the years 1916 and 1917 to make the radium doses smaller. The result was that we saw no fistulae but had a relatively small percentage of permanent cures (44 per cent of operated cases), but better than those operated without radiation. The cause of fistulae and necrosis with my first method was at first incomprehensible to me because I had always used doses far below the dosage applied without injury in the cases we did not operate, but I had forgotten that in nonoperated cases we have a rather thick layer of cervix or carcinoma tissue between the radium and the organs which had to be spared, such as the bladder, the ureter and the rectum, and this layer of tissue acted like a screen and kept the radium at a suitable distance.

It became clear to me that necrosis and fistulae would result more readily if the protective screen were removed by the extirpation of the uterus. Besides I had overlooked a second point, the vaginal stump is poorly nourished and like all scar tissue is exceedingly sensitive to rays, so that already relatively small doses lead to injury. Thus we were in the following situations: If we applied sufficient large doses, we had much better results, but fistulae and necrosis appeared; if we made the dose smaller, we failed to obtain better results than we had accomplished without postradiation. The problem to be solved was: Can a sufficient dose be applied to the desired place without danger of injuring sensitive tissue? The two previously mentioned cases in which I had ap-

plied radium immediately after the operation pointed to the solution of the problem. In these cases the remaining carcinoma tissue was in immediate contact with the introduced radium tube so I was not obliged to use very heavy dosages, because I intended a penetration of few millimeters only. The solution was to apply the radium exactly as I applied it in my first two cases. Since 1917 I have been doing this in the following way: When, after extirpation of the uterus, the peritoneum is closed, I protect the ureters with sterile gauze and insert in each of the parametrial wound cavities 50 mg. of suitably screened radium. The radium remains about six to eight hours. This is the standard method. In cases where I doubt the advisability of being radical with my operation or in cases where there remains suspected infiltrations in the sacro-uterine ligaments, a 3 mg. or even a 4 mg. radium tube is laid in the ap-

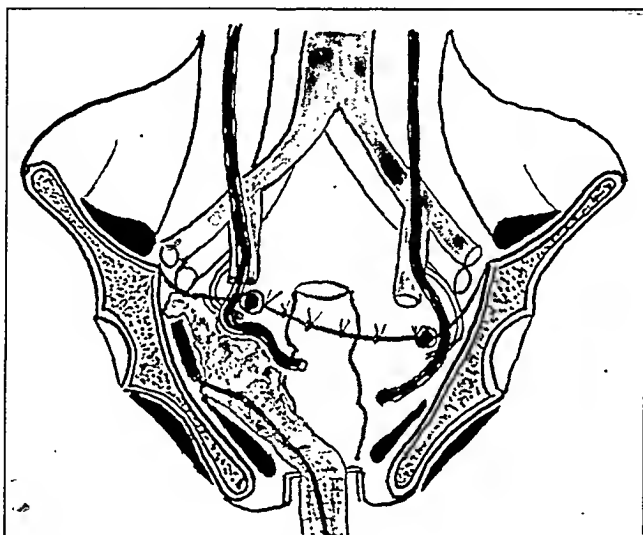


Fig. 1.—Cross section of pelvis showing radium capsule and gauze pack in situ after vaginal hysterectomy.

propriate place. Besides this, beginning two months after the operation, I apply from six to eight prophylactic postoperative cross-fire radiations, placing the radium in the rectum and in the vagina for about three hours. This prophylactic radium application is combined principally with roentgen radiation and in fact usually three series are applied of which the first contains nearly the full carcinoma dose. These series are applied at from three- to six-month intervals.

As far as I know my method of treatment is used at the present time by Knauer in Graz, by Franke in Bonn, by Stöckel in Berlin, and in the Clinic Rosner in Craeow.

Any new method of treatment, if it is worth using, must accomplish two fundamental conditions: First, it must be free from danger and second, it must bring results.

I have used my method in about 400 cases without any complications except transitory rises of temperature. Also from the clinics and sta-

tions which are using my method no disagreeable accidents have so far been reported. The second demand which is expected of a new method is that its results are better than that of the one previously in use. In this regard, I am happy to be able to submit the following facts: From the year 1917 until 1920, not all patients were treated according to my method. As it sometimes happens in clinics, what the one assistant recommends is not always approved of by the other assistant and consequently is not done. This occurred also at the Clinic Schauta. If, thus, the number of cases treated according to my method has been less, I am in the agreeable position to make use of very valuable material for comparison.

If I compare the results of the patients treated according to my method with those cases not postradiated, then cases observed after two

TABLE VI. POSTOPERATIVE RADIATION EXTENDS THE LIFE AND INCREASES NUMBER OF PERMANENT CURES

OPERATED STILL LIVING		
	WITH RADIATION	WITHOUT RADIATION
+1 year	92.8%	72%
+2 years	72.0%	61%
+3 years	61.8%	52%
	PERMANENT RESULTS	
+5 years	58.8%	42%

TABLE VII. FIVE YEAR CURES

RADIATION	World Literature	17.45%	
	Forsell-Heyman		23.3%
	Bowing-Fricke		23.0%
	George Gray Ward		23.6%
			(21.8)
OPERATION	World Literature	19.1%	
	Bonney (abd.)		25.0%
	Schauta (vag.)		22.5%
OPERATION + RADIATION	Franque (abd.)		28.1%
	Peham (vag.)		28.0%
	Adler (vag.) 3rd method		31.8%

TABLE VIII. STATISTICS OF WILHELMINENSPITAL, 1922-1926

Absolute cures		36.4 %
Vaginal operation	} with Radiation	87.25%
Abdominal operation		4.25%
Radiation only		8.5 %

years show an increase in relative cures from 72 per cent to 92.8 per cent, and after three years observation from 69 per cent to 72 per cent. These are only temporary cures. What is important in considering the worth of the method, are the permanent cures. My results show that the number of permanent cures (five years or more) increased from 42 per cent to 58.8 per cent. The absolute cure percentage which I obtained with my method is 32 per cent. Comparing these results with the results of laparotomy and with the permanent results of vaginal carcinoma operations with insufficient postradiation, I do not only think myself authorized, but I feel obligated to publish my procedure and to submit it to the profession for trial. Finally I want to say a few words concerning the statistics of cancer treatment in general. We know that with every kind of cancer treatment the application is only local and that cancer very likely is a local disease only in its beginning stages. As long as science has not given us the means to carry out successfully the general treatment of cancer, we must endeavor to make possible on the one hand early diagnosis and treatment, and, on the other hand, to carry out the treatment instituted as energetically as possible.

I have shown and reported the results obtained in carcinoma treatment with the vaginal operation and radiation which is my routine method. But in the treatment of cancer we must not be dogmatic but eclectic and I wish to emphasize that I do not adhere by any means to the vaginal operation in every case. In some cases, however very rarely, I do a laparotomy. But in these cases I likewise insert radium into the parametrial wound cavity immediately after the operation as after the vaginal operation. Finally, I have not operated on other operable cases but only treated them with radiation.

Briefly then, in summary I want to state that we must not adhere to one method but choose for each case the adequate procedure. Therefore I desire to repeat a request which I made before the Berlin Gynecological Congress ten years ago. We must break off with the old method of gathering statistics. Every gynecologist should take up in his statistics all cases which he sees and all cases in which the patients are living free of recurrence after five years, no matter if they were operated upon by the vaginal operation, the abdominal operation, or treated with radiation only, all these must be considered as permanent cures. In this way one will get a correct picture of the value of the treatment used in different places by different men. If I examine, in this sense, my material from 1920 to 1926, then I arrive at a percentage of 36 per cent absolute cures (five year). This encourages me to adhere to the path I have taken and to request an examination and trial of the method of treatment which I have developed.

ENDOMETRIAL TRANSPLANTATION*

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CLINICAL evidence seems to indicate that when endometrial cells are displaced from their usual location, they continue to grow and sometimes produce symptoms. Adenomas occurring in laparotomy scars are ample evidence of this vicarious growth. The method of displacement in these instances is quite definite; namely, operative procedures which include the uterine mucous membrane.

The reasons why this does not occur more frequently and what conditions are necessary when it does occur, are important questions yet to be settled. We do know that normal endometrium is a tissue that possesses a peculiar viability. In addition, it has a marked power of proliferation which we see so well expressed during the changes incident to pregnancy and the rehabilitation of the mucosa following a menstrual period.

The cells of the endometrium are, therefore, in a constant state of change, due to cyclic stimuli. Embryonal cells quickly grow to maturity and are again replaced by a group of new cells of high vitality. Cron and Gey¹ have shown that even the cells of the older endometrium cast off at menstruation can readily be grown in culture media.

The stimuli which produce the rhythmic changes in these structures of the female pelvis are the result of the action of the female sex hormone or hormones, which is being so actively investigated at the present time. Whatever they may be, the fact remains that cell structure in the female pelvis and, particularly the endometrium, is under the control of factors that have much to do with cell growth and vitality.

Numerous investigators^{2, 3, 4, 5} have shown that when endometrial tissue is transplanted in the experimental animal, it retains its power of growth. Sensitiveness to ovarian³ and pregnant⁶ stimuli is maintained. Heterotopic endometrium in the human female displays the same predisposition to shed blood at the menstrual time and produce a decidual reaction during pregnancy.

Sampson⁷ has produced splendid clinical evidence to support his theory of mechanical regurgitation through the fallopian tubes. The supporters of the serosal theory, notably Robert Meyer⁸ and Novak⁹ believe that the preponderance of evidence indicates a metaplasia or heteroplasia of the peritoneum.

*Read before the Central Association of Gynecologists and Obstetricians, Excelsior Springs, Mo., October 10, 1930.

Neither theory adequately explains all of the conditions met with in clinical endometriosis. Much work remains to be done to establish these important questions.

Schochet,¹⁰ in 1916, reported a series of ovarian transplants into the anterior chamber of the eye. He failed to find a metaplasia of the surface epithelium or peritoneum into endometrial-like tissue.

In 1928 Dr. Bauer and I⁶ reported the results of transplanting endometrium from the uterus of rabbits into the anterior chamber of the eye. In this series, we found that endometrial tissue transplanted into this location shows certain definite characteristics, most definite of which was a marked tendency to proliferation with the formation of



Fig. 1.—The course of a blood vessel extending from the iris into the substance of the implant is well shown. The proliferation of typical epithelium outward in both directions from the base of the iris is quite clearly shown.

gland-like spaces. These gland-like structures seemed to have the ability to invade other tissues, such as the iris. We were not able, however, to demonstrate a proliferation of the stromal connective tissue. This seemed to us an important problem, because we find in these islands of heterotopic endometrium in the human a typical connective tissue framework. Are these cells transplanted along with the epithelial elements en masse; are they outgrowths from the original location, or are they local cell reactions to the presence of heterotopic epithelium?

These questions form the basis of this continuation of our previous experiments.

EXPERIMENTAL

We followed the same procedure as we used in our previous work. Small bits of endometrium, ovary and peritoneum were removed and

slipped immediately into the anterior chamber of the eye. For comparison, in a few animals endometrium was implanted into one eye and rather large strips of peritoneum or ovary into the opposite eye. Twenty-five rabbits were used; they were killed and autopsied at intervals of from fifteen days to thirteen months. The eyes were enucleated, at once fixed in Mueller's solution and cut in celloidin. Sections were stained with eosin and hemotoxylin to study the extent and type of epithelial proliferation. The connective tissue was stained by Dr. George Bartelmez with the Bielchowsky colloidal silver method to differentiate the stromal reaction from the connective tissue cells of the iris.



Fig. 2.—The proliferation of epithelium through the pupil onto the under surface of the iris is quite marked in this section. Note the definite subepithelial connective tissue.

RESULTS

Vascularization occurred in the endometrial transplants very rapidly. Occasionally blood vessels could be seen extending toward the implant within twenty-four hours. At the end of three or four days, this was very pronounced and continued so, at least in the larger bits of tissue, until removal of the eye. The alternate blanching and congestion of the implant reported by Schochet and Markee²¹ was noted several times, but did not seem so marked as they report in the guinea pig. The connections with the vessels of the iris are quite definite. (Fig. 1.)

The epithelium of the implant proliferates outward from the periphery. It often crosses over or through the pupil (Fig. 2), passing over the anterior surface of the iris around the external angle and for varying distances on to the posterior surface of the cornea. These new

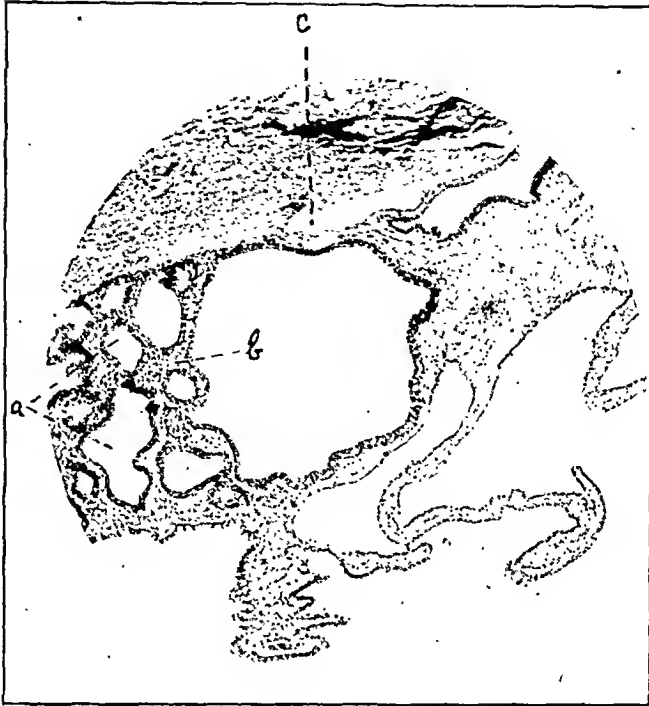


Fig. 3.—In this section a typical group of endometrial-like glands (*a*) surrounded by an embryonal connective tissue stroma (*b*) lies deep in the ciliary body. It is separated by normal ciliary tissue from the external angle of the anterior chamber (*c*).

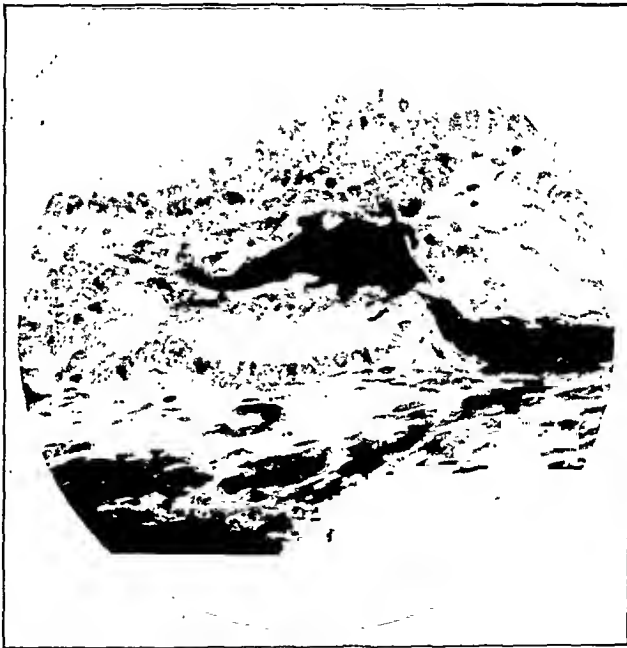


Fig. 4.—The epithelium in this specimen has proliferated downward to produce a gland-like space in the substance of the iris.

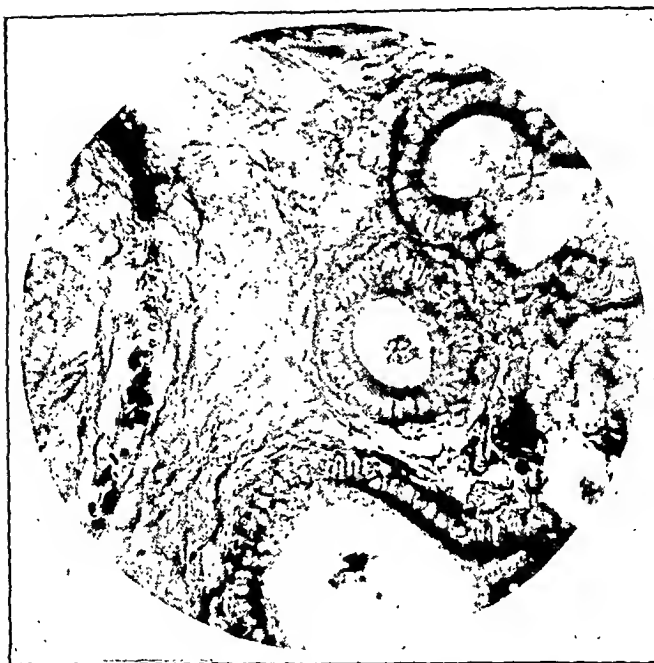


Fig. 5.—The typical deposit of silver salts in the epithelium and reticular framework of the body of the implant corresponds to that of the normal endometrium.

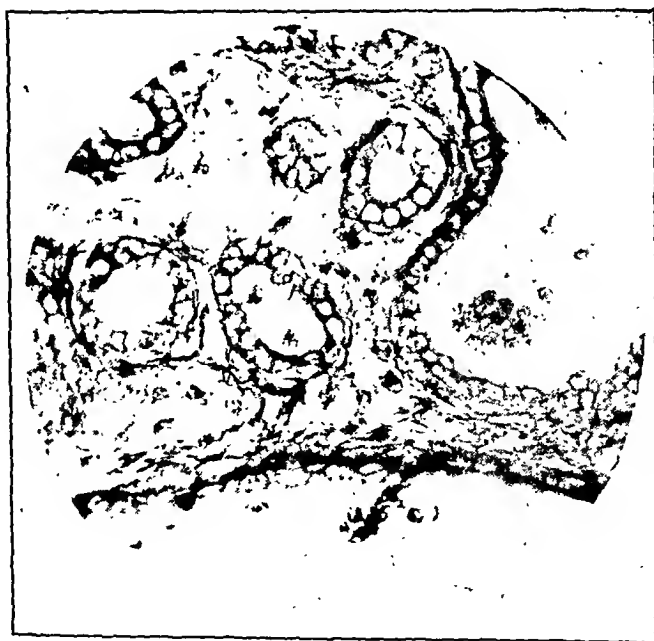


Fig. 6.—Reticular staining in the new connective tissue is not definite. Probably due to the presence of or obscured by the pigment in the iris.

epithelial cells are often ciliated and, in some instances, seem to exhibit secretory activity. This single layer of epithelium is frequently modified to produce gland-like spaces in the angles of the anterior chamber or proliferates downward into the substance of the iris. (Figs. 3 and 4.)

Beneath this layer of new epithelial cells and surrounding these gland-like spaces a stroma of connective tissue appears. This fibrous stroma stained with eosin and hemotoxylin seems definitely different from the connective tissue of adjacent structures. With the Bielchowsky method a thick deposit of silver is formed in this subepithelial connective tissue. We could not however differentiate a characteristic reticulum like we find in the stroma of the implant itself. (Figs. 5 and 6.)

When we attempt to trace these areas of new connective tissue in a continuous layer back to the base of the implant as a source, which we can easily do with the epithelium, we find no connection. It seems

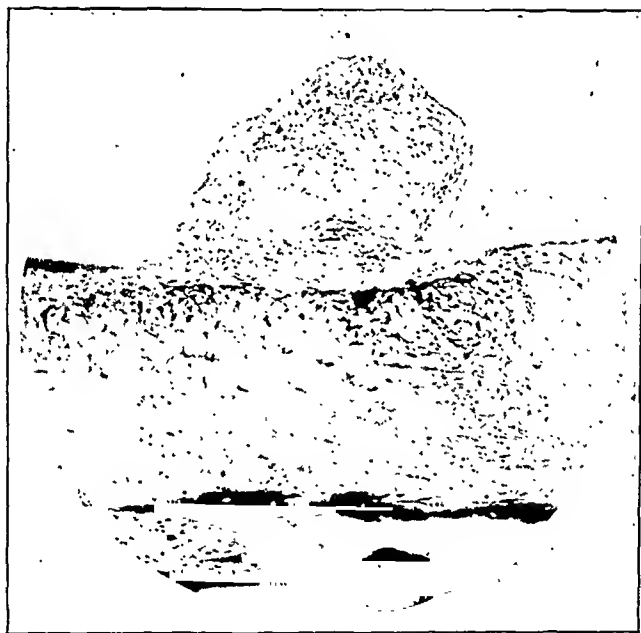


Fig. 7.—The sclerotic bit of tissue left from the implantation of peritoneum. Note the total absence of epithelium both around the implant and on the anterior surface of the iris.

to be only a localized proliferation in widely separated areas. This phenomenon may be the explanation why some areas in human endometriosis are rich in stroma while others are almost entirely epithelial.

We did not find any evidence of proliferation or cell response to foreign tissue in any of the eyes containing peritoneum or ovarian substance. The epithelium of the peritoneum is very difficult to preserve during the necessary manipulations, and may have been destroyed before reaching the site of implantation. The final result revealed a minute sclerotic bit of connective tissue attached to the iris. (Fig. 7.)

The same lack of metaplasia of the germinal or follicular epithelium occurred in spite of actively ovulating ovarian tissue. (Figs. 8 and 9.)

In several instances the proliferated epithelium revealed many characteristics of tubal epithelium; namely, marked ciliation of all cells and the appearance of definite secretion granules. If investigation proves that this does not occur normally in the uterine mucosa of rabbits during the estrus cycle, we may have another avenue opened for the study of those factors causing heteroplasia of cells.

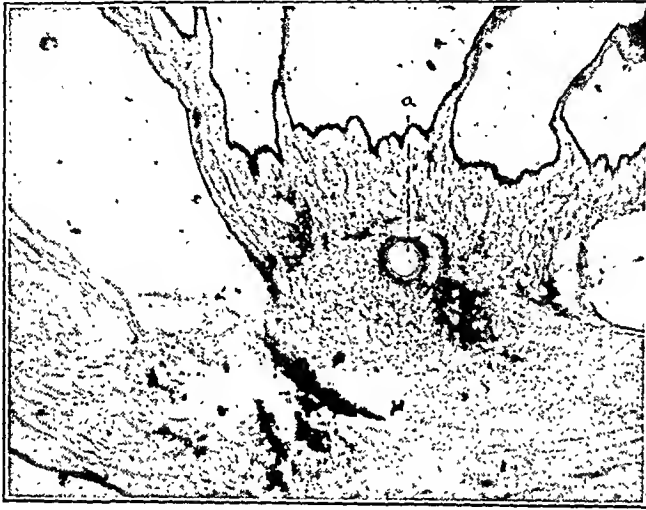


Fig. 8.—A ripening follicle (a) is shown here deep in the ciliary body. No other epithelial proliferation is present.

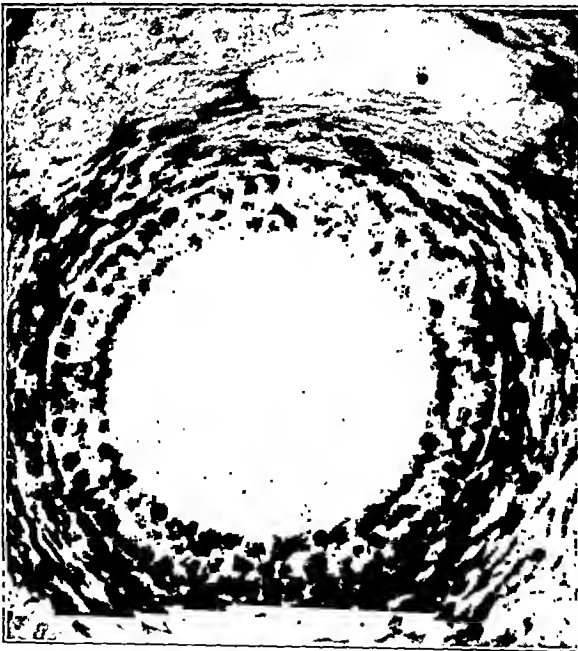


Fig. 9.—A higher power magnification of the follicle shown in the previous plate reveals its structure in detail.

CONCLUSIONS

Definite conclusions are hard to draw but we feel that these experiments indicate:

1. Uterine epithelium in rabbits possesses more marked proliferative and heteroplastic tendencies than the epithelium of the peritoneum or ovary.

2. This proliferative tendency carries with it the property to stimulate a local connective tissue response.

3. Transplanted endometrial connective tissue does not tend to proliferate.

4. Follicular activity is maintained in this location for a considerable length of time.

5. Metaplasia of uterine epithelium may be produced by transplantation into the anterior chamber of the eye in rabbits.

This study was only made possible by the kind assistance of Dr. George Bartelmez in staining and interpreting the microscopic slides.

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25 EAST WASHINGTON.

Seckinger, D. L., and Snyder, F. F.: Cyclic Changes in the Spontaneous Contractions of the Human Fallopian Tube. Bulletin Johns Hopkins Hospital, 39: 371, 1926.

The cyclic changes in the activity of the muscular wall of the tube closely parallel chronologically the histologic changes occurring in the endometrium and tubal mucosa during the reproductive cycle as follows: During the mid- and late-interval stage, there are rapid contractions showing a marked variation in amplitude. During the premenstrual and menstrual phase, slow contractions of uniform amplitude are found. During pregnancy tubal contractions remain slow and of uniform amplitude.

Comparison with other mammals suggests that in the human the increased activity of the tubal wall during the mid- and late-interval stage is probably coincident with the passing of the ovum through the tube.

No change in the number or activity of the cilia lining the tube was noted at any phase of the reproductive cycle.

C. O. MALAND.

PREGNANCY AND LABOR COMPLICATED BY FIBROID TUMORS*

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IN THE time at my disposal I can only touch on certain of the aspects of this rather large subject. In doing so I shall not go into any detailed statistical study but rather try to give you the impressions and conclusions drawn from my own personal observation and experience of cases in which fibroid tumors of the uterus have presented a problem in relation to fertility, pregnancy, labor, and the puerperium.

INFLUENCE OF FIBROIDS ON FERTILITY AND OF FERTILITY OF FIBROIDS

It is very generally accepted that women with fibroid tumors of the uterus are less fertile than those who have none. Graves states that the average percentage of sterility in women in general is 10 to 15 while in women with fibroids it is in the neighborhood of 30 per cent. In the case of the larger tumors the sterility rate is even higher than that.

Women who have had children are less liable to develop fibroids than those who have had none. It is seldom that we find fibroids in the uterus of a woman under twenty-five years of age, and it is rare to find large tumors in a woman who has begun her childbearing before that age and who has had four or five children at two or three year intervals afterward. On the other hand from 30 to 50 per cent of nulliparae at the age of fifty have fibroid tumors. These facts lead to the old question as to whether the fibroids are the cause of the sterility or sterility is the cause of the fibroids. The answer cannot be given until we know something more about the etiology of these tumors. To reason in perhaps a not very scientific way, I am inclined to argue that the uterus is essentially an active organ, its main activity being the embedding, nourishing, and expulsion of the fertilized ovum. If this, its main occupation, is denied it occupies itself in growing fibroids. If a married woman voluntarily prevents pregnancy until she is over thirty or thirty-five or if a woman remains unmarried until after the age of thirty or thirty-five, her chances of having fibroids are greater than if she had had one or more children before that age.

*Read (by invitation) at a meeting of the Brooklyn Gynecological Society, April 3, 1931.

It has been rather a striking fact in my own personal experience with women in the late thirties and early forties who have been sterile for a number of years following marriage and have then become pregnant that a large proportion have fibroid tumors. The most striking example of this occurred last year when I had under my care a patient of forty-seven, childless since her marriage twenty-three years before. She ceased to menstruate and very naturally supposed that she was entering upon the menopause. I saw her after a period of four months' amenorrhea and diagnosed a pregnancy in a uterus containing several large fibroids, so that the uterus at this time reached well above the umbilicus. She went to term and was delivered of a healthy child by cesarean hysterectomy. In the past four years I have had seven other patients with fibroid tumors, all over thirty-five years of age when their first pregnancy occurred and all of them sterile for over seven years.

INCIDENCE OF FIBROIDS IN PREGNANT WOMEN

Two previous reports have been made on the incidence of fibroids in pregnant women in the Sloane Hospital. Craigin and Ryder in 20,000 cases found 89 or 0.45 per cent. Pierson in 30,856 cases found 250 or 0.8 per cent. In the 11,675 patients delivered in the hospital from the date of Pierson's report to the end of February, 1931, fibroids were noted in 157, an incidence of 1.3 per cent. The steadily rising incidence figure is probably due to more accurate reporting for many of the tumors in our present series were extremely small and were of no clinical importance. In forty of the 150 cases the diagnosis might very well be regarded as doubtful. We may take it then that the incidence of significant fibroid tumors in pregnancy appears to be round one per cent. This bears out the belief that fibroid tumors are a cause of sterility as the incidence in a similar age group of all women would show a higher percentage of tumors. The average age of those patients who had significant fibroids was thirty-three.

In addition to causing sterility fibroid tumors are apt to lead to abortion, miscarriage, and premature labor. There is a history of 71 early and late abortions in our 157 patients. This is above the average for women in general. There were also 24 premature labors which again is a high figure. These numbers are in accord with other statistics quoted by Pierson in which the abortion and premature labor rate ranges from 15 to 24 per cent.

When an otherwise normal woman with a fibroid tumor in her uterus remains sterile or has one or more abortions it is a fair assumption that the fibroid is the cause of her disability. In such cases a myomectomy should be advised. One of the great advances in gynecology in the past ten years is the increasing number of myomectomies which are being performed in preference to hysterectomies. It

is possible to enucleate even large tumors and leave a functioning uterus. With proper closure of the beds of the tumors the uterine wall should be as strong as ever it was and such of these patients as subsequently become pregnant should be able to deliver per vaginam. I do not know if it is the experience of others but I have noticed several times that the first pregnancy following a myomectomy not infrequently terminates in abortion. I have observed the same thing in patients on whom a suspension of the uterus has been done for retroversion causing sterility or abortion. In both conditions subsequent pregnancies usually proceed normally. So much have I been struck by those facts that I warn patients not to be disappointed if the first pregnancy after operation terminates prematurely. At least one year should elapse between operation and the beginning of a pregnancy. The following case illustrates the point:

Mrs. W., aged thirty-six. Married for three years, no pregnancy. For past four years menstruation more profuse than before. Examination showed a retroverted uterus containing a fibroid tumor the size of an orange in the uterine wall. Myomectomy recommended but operation not consented to until a year and one-half later by which time the tumor was considerably larger. At operation a large interstitial fibroid was enucleated together with five smaller ones, the largest of which was the size of a walnut. Convalescence was uninterrupted. Ten months later she became pregnant, had a missed abortion at the second month and was curetted at the end of the third month. In this case no further pregnancy has occurred so far.

THE COURSE OF PREGNANCY IN A UTERUS WITH FIBROID TUMORS

Abortion and premature labor have been referred to. In a large number of cases in which the fibroid or fibroids are small the patient experiences no disability whatever. Such tumors may only become apparent in the third trimester and when situated in the anterior wall may be more easily palpable toward full term. The reason for this is that small interstitial and subserous nodules tend to be projected as distinct knobs as the uterus distends and its wall thins out. This is the factor which makes myomectomy such an easy procedure when done at the time of a cesarean section or in the course of pregnancy. On the other hand large multiple tumors may become less defined and less easily palpable toward term owing to the general softening of the uterus. I have often been surprised at the large size of tumors at the time of cesarean section in patients whom I had not seen in the earlier months. Such observations have encouraged me in cases seen early to advise the continuance of pregnancy even when the tumors were large and when it seemed hardly possible that the abdomen could accommodate them and a full-term pregnancy as well. The patient may have more discomfort than ordinarily experienced toward term but in the absence of complications has, in my experience, been able to continue the pregnancy to term or so near to it that a strong child was

assured. It is truly astounding how in such cases the abdomen manages to accommodate the large bulk of child plus tumor.

Some apprehension may be felt as to whether the presence of these large tumors may cause some fetal deformity or may favor such a complication as placenta previa. In our present series of 157 cases there was one child with clubfoot and one case of placenta previa. It is now established that fetal deformity is practically always developmental and not environmental in origin.

The complication most often encountered during pregnancy is necrobiosis or red degeneration. It was present in 23 out of 41 patients in whom hysterectomy or myomectomy was done. It is a complication which may occur in a fibroid tumor at any time but is especially common during pregnancy and in the puerperium. It is a vascular lesion resulting from interference with the blood supply to the tumor. There is extravasation of blood and deposit of blood pigment so that the tumor becomes red in color, resembling a raw beefsteak on section. The tumor cells die so that on section all nuclear staining is lost and only the outlines of the cell bodies remain. In other words it is an infarction. Later the tumor becomes dull grey in color and it may break down and liquefy. As a rule it remains sterile but secondary organismal invasion from the uterine cavity or from intestinal adhesions may occur. Apparently it takes several months for gross breaking down of the tumor to occur. It is frequently seen at term when from the symptoms it is known that the complication began early in pregnancy. These symptoms are pain at the site of the tumor in the uterine wall, tenderness which may amount to acute pain on palpation, and temperature which seldom exceeds 100° or 101° , except in secondarily infected cases. Pain and tenderness, together with some rise in temperature, are practically pathognomonic of red degeneration of a fibroid in either the pregnant or the nonpregnant uterus. Ten years ago operative interference was regarded as necessary whenever those symptoms appeared. Increased experience has shown that even when they appear fairly early in pregnancy it is usually possible to carry the patient along to term or at any rate to the period of viability when operation can be undertaken with the hope of a living child. In a certain number of cases operative interference may be imperative earlier in pregnancy.

Let me cite one or two cases to illustrate these points:

CASE 1.—Mrs. B., aged thirty-eight; married for seven years. No pregnancies until the present one. Was told six years before that she had uterine fibroids. Seen by me when she had missed one menstrual period. At this time irregular tumor masses could be felt reaching to the umbilicus and it was impossible to diagnose pregnancy with certainty. There was considerable tenderness over the largest of the tumor masses, and the patient had had a good deal of pain three weeks previously but this was now less severe. As the pregnancy progressed the pain and tenderness diminished. The note made at the fifth month says, "Uterus is ac-

commodating itself very well to the abdomen." At the end of the sixth month it is noted that "the tumors feel softer" and at the end of the seventh month my record states that "fibroids cannot now be distinguished from the rest of the uterus except one felt through the vaginal fornix which displaces the cervix to the left." Cesarean hysterectomy was performed two weeks short of term. The largest tumor showed liquefaction secondary to a red degeneration, the surrounding tissue being grey in appearance.

CASE 2.—Mrs. M., aged thirty-five. Married eight years. At age of twenty-nine had a myomectomy and suspension of uterus. First seen by me in the sixth month of her first pregnancy. At this time the uterus reached almost to the costal margin and several hard nodules as big as apples could be felt in the wall. There was also one to be felt in the lower uterine segment, displacing the cervix well away from the midline of the pelvis. For ten days patient had had sharp pain in the abdomen and one of the tumors, on the left side was very tender to touch. Pain and tenderness lasted for about two weeks and then subsided. Patient went to term. Cesarean section was performed and, owing to the multiplicity of the tumors, was followed by supravaginal hysterectomy. Examination of the tumors showed the one on the left side to be liquefied in the center, the surrounding tissue being pale grey in appearance.

The next cases also showed red degeneration but the symptoms were much more severe. Patient was carried, however, to the period of viability and a healthy child delivered by cesarean section followed by myomectomy.

CASE 3.—Mrs. Z., aged thirty-four. Gravid i. Para o. First seen by me when three months pregnant. At that time a firm, solid mass could be felt reaching to umbilicus to the left of midline and a smaller one to the right. Cervix and lower uterine segment soft. At the fifth month pain and tenderness appeared in the tumor on the left. This persisted in varying degree until term. From time to time she had to remain in bed for one or two days. Cesarean section was performed within two weeks of term, four fibroids enucleated from the wall. The largest, that on the left side, was dull grey in color, and was liquefied in its center.

CASE 4.—Mrs. H., aged thirty-nine. Married for fourteen months. First seen in the fourth month of her first pregnancy when several large fibroids were detected, one of them in the posterior culdesac and fixed in the pelvis. She complained of dull pain in the lower abdomen with acute exacerbations from time to time. She was extremely anxious to have a child and readily consented to hospitalization. She remained in the hospital for four months. She had practically continuous pain, at times so severe as to necessitate various sedatives and hypnotics. The tumors in the abdomen and pelvis were tender throughout. There were occasional rises in temperature but it never went over 100°. Cesarean hysterectomy was performed at the end of the eighth month. Child well developed and healthy. All of the tumors showed red degeneration, the pelvic one having a large cavity in its center filled with dark syrupy fluid.

It is not always possible to postpone operation until near term. In the case which follows I was mistaken in my diagnosis but even had a correct diagnosis been made I doubt if any other procedure would have been justified.

CASE 5.—Mrs. K., aged twenty-six. Seen by me in consultation when she was four and one-half months pregnant on account of severe lower abdominal pain, vomiting,

and retention of urine. Her doctor had made a diagnosis of retroflexed gravid uterus. Examination showed the uterus in the abdomen and a round, very tender swelling filling up the pouch of Douglas and pushing the cervix above the pubes. I made a diagnosis of incarcerated ovarian tumor with twisted pedicle. On opening the abdomen the swelling was found to be an intramural fibroid the size of a large orange growing from low down on the posterior uterine wall. Myomectomy was done and the bed of the tumor closed. She miscarried twenty-four hours later. The tumor showed acute red degeneration. Two years subsequently she had a normal delivery.

In the following case hysterectomy was deemed wise at the fourth month.

CASE 6.—Mrs. S., aged forty. Colored. Married for twenty years but never pregnant until the present time. She was seen in the gynecologic clinic January 20, 1931, and gave a history of having had her last menstrual period in October, 1930. Shortly after missing her November period she began to have severe pain in the left side of the abdomen and had "chills and fever." Pain continued and she began to lose weight. When first seen in January, 1931, after three months' amenorrhea a mass could be felt in the abdomen reaching well above the umbilicus. It was irregular in outline and tender on palpation. The softened cervix and lower uterine segment together with a positive Aschheim-Zondek test established the diagnosis of pregnancy. She was seen from time to time in the clinic but as pain continued she was admitted to the hospital for observation and treatment. During the following ten days pain and tenderness increased, and as she was not at all anxious to have a child and could not promise cooperation by prolonged hospitalization it was deemed wise to operate immediately. The uterus contained several large fibroids, all interstitial, so subtotal hysterectomy was done leaving both tubes and ovaries. The tumors all showed red degeneration, the larger ones being broken down and liquefied in the center.

Let me mention and illustrate with a case, a much rarer acute complication which may necessitate immediate operation, viz., torsion of the pedicle of the tumor.

CASE 7.—Mrs. U., aged thirty-five. Married for two years before she became pregnant in July, 1930. Seen by me when three months pregnant at which time the uterus plus fibroids reached to above the umbilicus. Several distinct large tumors could be outlined, the largest about the size of a grapefruit. She progressed normally until the fourth month when she had a severe attack of abdominal pain with vomiting. She was brought into the city four days later, pain and vomiting having continued. Pulse was rapid and she was dehydrated. The abdomen was distended and the tumor on the right side exquisitely tender. On opening the abdomen a pedunculated tumor presented. Its pedicle had a twist of 360 degrees and the tumor was dark in color. As there were other large fibroids present it was deemed wise to do a supravaginal hysterectomy.

EFFECTS OF FIBROIDS ON LABOR

That fibroids complicate labor is evident from the following statistics of our 157 cases. In those there were 71 operative and breech deliveries, making 48 per cent of the total. These included 23 forceps extractions, 4 versions, 35 cesarean sections, and 9 breeches. Of the 35 cesarean sections only 15 were performed primarily because of the fibroids. In the other 20 the operation was done on some other indica-

tion and the fibroids, usually small ones, were discovered after the abdomen was opened.

There were two intrauterine fetal deaths and 18 stillbirths.

Adherent placenta was encountered only twice. Both patients had small submucous tumors and both had had several abortions.

Postpartum hemorrhage occurred in three cases. In none of them was it severe. As mentioned before there was one case of placenta previa.

There were four maternal deaths but in only one could the death be ascribed to the fibroid complication. This patient had large fibroids; she had several fainting spells during her pregnancy and had a very variable blood pressure. A cesarean hysterectomy was performed and she died three hours thereafter of cardiac failure. The abdominal wound was reopened on the chance that there might be a hemorrhage from a slipped ligature but none was found. The condition of the myocardium in women with large fibroids should always be taken into account. If there is evidence of impairment of function and the patient is pregnant it may be better to perform hysterectomy early rather than let the pregnancy continue.

The other three deaths were due to (1) tuberculosis of the kidneys; (2) pneumonia following cesarean section done for flat pelvis, the fibroids being unimportant and (3) chronic cardiac valvular disease in a patient who had cesarean section performed because of this and because of a contracted pelvis, the fibroids being unimportant.

It is evident from this recital that fibroid tumors of appreciable size whether multiple or single are a serious complication of pregnancy and labor. But if each individual case is carefully studied and the proper line of treatment mapped out and properly executed a favorable outcome to mother and child can usually be assured. It should be explained to the patient as early as possible that if the pregnancy is to continue she may require to spend a considerable part of the time in bed and that she may have some pain. If she is unwilling or unable to face these possibilities or if it is evident at any time during the pregnancy that degenerative processes are progressing very rapidly or that the myocardium is showing signs of impairment immediate hysterectomy or myomectomy should be advised.

It is advocated by some obstetricians and gynecologists that myomectomy should be performed early in pregnancy in all cases and some go so far as to empty the uterus from below before performing it. I cannot subscribe to this method. The pregnancy in progress may be the only pregnancy the patient may have, especially if she is elderly. A myomectomy during pregnancy is very likely to cause abortion. In this series of cases there were three myomectomies done during pregnancy; one, which aborted in twenty-four hours, has already been mentioned. A second was performed at the sixth month on a mis-

taken diagnosis of twisted ovarian cyst. On opening the abdomen a soft, fluctuant fibroid, the size of a fetal head, was found attached to the fundus by a pedicle of three inch diameter. Another smaller, more sessile tumor was situated lower down and a few seedling tumors were present in other parts of the wall. In removing the larger tumor considerable hemorrhage was encountered which owing to the tenseness of the uterine wall could not be controlled by suture. Rather than sacrifice the uterus it was, therefore, determined to perform hysterotomy. The fetus and placenta were removed when it was found that the larger tumor was over the placental site. With the emptying of the uterus the bleeding was easily controlled and the other tumors were enucleated. Both the large tumors showed red degeneration and necrosis, the wall of the largest one being a mere shell enclosing fluid contents. This patient had a normal delivery fourteen months later. The third case of myomectomy was one in which in the course of an operation for appendicitis in a woman in the third month of pregnancy two small subserous fibroids were found in the uterine wall and removed. She delivered normally at term.

A myomectomy or a hysterectomy can be performed at any time during a pregnancy if some acute complication renders such procedure necessary. Such interference should be withheld until the emergency arises. Myomectomy at the time of cesarean section is usually an easy procedure. When the shelling out of the tumor is done carefully there is not excessive bleeding. Cervical and intraligamentous tumors may be more easily dealt with then than at any other time. It is my rule to perform either myomectomy or hysterectomy at the same time as a cesarean section when the latter has been undertaken because of the fibroids. So far I have not had the courage to leave a uterus containing large fibroids on the chance of a succeeding pregnancy and another cesarean section.

A subconscious love of the dramatic may have led me to place too much emphasis on the operative side of this subject and I must take care that I do not convey the impression that operative interference is necessary in the majority of cases where fibroids complicate pregnancy. Small fibroids even when several are present in the uterine wall have little effect on labor. Subserous nodules are more easily palpable during contractions and may be distinctly tender. In such cases labor usually progresses normally. When there are several tumors of the larger type uterine contractions are adversely affected, they are less powerful and less effective than normal, both in the first and second stages. For this reason if the patient is a primigravida over thirty-five years of age the safest method of delivery may be by cesarean section. In younger women and in multiparae if there is no tumor obstructing the pelvic canal and there is no evidence of red degeneration, the patients may be given a trial of labor, operation

being resorted to only when it becomes evident that only very slow progress in the first stage is being made. If one of the tumors is actually in the pelvis displacing the cervix or obstructing the canal cesarean section is usually imperative. It is sometimes found, however, that a tumor growing from the lower uterine segment and definitely in the pelvis at the end of pregnancy is pulled up during the first stage of labor so permitting delivery per vaginam. In the case of pedunculated tumors it may be possible to push them above the pelvic brim at the time of labor. The following cases are illustrative of this:

Mrs. H., aged twenty-eight, para i. One pregnancy four years before. Seen for first time when four months pregnant when a fibroid tumor the size of a large orange could be felt in the left side low down in the uterine wall. Patient was hospitalized twice during her pregnancy on account of pain in the tumor and pyelitis. At term she went into spontaneous labor. The head was high above the brim until the end of the first stage. The fibroid, meantime, had risen well above the brim. The head then entered the pelvis and the patient had a spontaneous delivery of a healthy child, the whole labor lasting nine hours. This patient now three months postpartum is to enter the hospital soon for myomectomy. The tumor is now painless and is not tender.

Mrs. C., aged thirty, para ii. Last pregnancy four years ago. At the onset of labor it was found that there was a firm rounded swelling, the size of an orange, in the posterior culdesac. With two fingers in the rectum this could be pushed above the pelvic brim allowing the head to enter. An easy midforceps extraction was done, the whole labor occupying seven hours. Patient ran a temperature for the first six days of the puerperium with considerable lower abdominal pain. The pelvic tumor was easily palpable in the pouch of Douglas on her discharge. Six months later the tumor was removed. It was a pedicled fibroid with red degeneration.

When a patient with uterine fibroids has delivered from below there is a liability of red degeneration developing during the puerperium or, having begun during pregnancy, progressing postpartum. When symptoms are acute with marked pain and tenderness immediate myomectomy or hysterectomy should be performed. In our present series of cases there were 7 in which hysterectomy was performed subsequent to delivery, the earliest being done two months postpartum.

ATROPHY AND DISAPPEARANCE OF TUMORS AFTER LABOR

It is commonly stated in our textbooks that fibroids tend to atrophy and may entirely disappear after pregnancy and labor. In our records there are several cases in which it is noted that small tumors diagnosed during pregnancy were undetectable in the postpartum follow-up clinic. We have no record of a tumor of moderate size disappearing, and it is a very difficult thing to be certain of diminution in size. I wonder if some of the cases of disappearance of the larger tumors are possibly cases of red degeneration with liquefaction and absorption. That moderate sized tumors may diminish very materially

in size or even disappear seems to be an undisputed clinical fact but I have not personally observed it.

* * *

To sum up it may be stated that while fibroid tumors may constitute a major complication of pregnancy, labor and the puerperium, the smaller tumors usually permit the patient to proceed to term and deliver normally or with ordinary obstetric assistance. Every patient with fibroids of significant size requires careful watching and guiding during her pregnancy. The most frequent complication during pregnancy is red degeneration. While in some instances symptoms of this may be so acute as to necessitate surgical intervention in the course of the pregnancy, in the majority of cases the patient can be carried to term and delivered by cesarean section followed by myomectomy or hysterectomy. Or she may be delivered per vaginam and a subsequent myomectomy or hysterectomy be done. The size of the tumor may necessitate removal before term but in the absence of acute symptoms time should be given to see whether the abdomen will not accommodate it.

(For discussion, see page 445.)

THE TREATMENT OF OCCIPITOPOSTERIOR POSITIONS WITH ESPECIAL REFERENCE TO MANUAL ROTATION*

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THE management of occipitoposterior positions has been the subject of a voluminous literature. My only reason for adding to the already large amount of material which exists is the desire briefly to discuss the procedure which has been of very great assistance to my associates and myself in the Evanston Hospital.

While it is true that today obliquely posterior positions are not regarded as seriously as they were they still occasion some anxiety. Varying methods of dealing with them have been proposed and used, in some instances with great satisfaction, by various writers. It is probable that some of the dread which posterior position occasions is, as Williams suggests, due to the fact that many posterior positions are unrecognized and anterior rotation takes place without the attendant's knowledge and delivery follows normally. Many of those which terminate favorably are therefore not recognized as posterior positions and only those in which deep transverse arrest or posterior rotation occurs are diagnosticated as posterior positions. That this is possible is apparent to any obstetrician of experience for cases are occasion-

*Read before the Chicago Gynecological Society, April 17, 1931.

ally seen in consultation in which women have been long in labor with a posterior position of which the attendant has been quite unaware.

I have taken as a basis for this report the cases of occipitoposterior position occurring in my own private practice in the past six years. These number 285 out of a total of 1,131 private cases. Posterior positions were therefore 25.1 per cent of this number and included 256 R.O.P. and 29 L.O.P. presentations.

As I desire to discuss a maneuver in which I am particularly interested it seemed better to make use of a series of personally managed cases rather than to include the entire hospital material. In all cases the general physical condition of the woman was known and pelvimetry had been done.

It is well known among obstetricians that the first stage of labor in the presence of a posterior position may be longer than is the case with anterior position. Precisely why this should be so is not easily explained but the fact is recognized.

Good obstetric strategy demands that the woman should be gotten into the second stage with her physical powers as nearly intact as may be and with the least possible impairment of her nervous forces. To this end the judicious employment of some form of opiate is often of great value. With sufficient relief of pain the majority of women who have long labors may be carried through the first stage without serious exhaustion. A greatly exhausted woman is more likely to become infected than one who is not. The exhausted woman is also more likely to bleed severely. The management of occipitoposterior positions may with entire propriety be said to begin in the first stage.

Dilatation should occur by the normal mechanism and any interference to hasten it should be avoided unless excellent reasons exist for doing something. Occasionally, when the last portion of dilatation is long in occurring, and it is feared that too great prolongation of the labor will result in bringing the woman into the second stage in a condition of too great fatigue, dilatation may be completed manually or by Dührssen's incisions. These cases should be chosen carefully after deliberate weighing of all factors. They are not frequent. The bag of waters should be preserved intact if possible until dilatation is complete or nearly so. Should rupture occur early in labor the recumbent position may assist in preserving at least some of the fluid in the uterus.

After complete dilatation has been attained voluntary effort on the part of the woman may begin. If any suspicion of disproportion exists it must now soon be decided whether it is present or not. The suggestion that the woman be caused to lie upon the side to which the occiput points has been made by various writers for many years. It should be treated with the respect due to age but my own experience leads me to believe that it is of little value. Apparently Williams has

arrived at the same conclusion. It is probable that in most instances the head enters the pelvis in the transverse diameter and turns toward the front or the back, most frequently the former, after passing the inlet. If the occiput turns backward, or if the head enters the pelvis with the occiput obliquely posterior, a posterior position results. As the head descends the most dependent portion, which, in the well flexed head is the occiput, tends to rotate to the front after striking the pelvic floor. Thus a partially deflexed head is rather more apt to rotate posteriorly.

After dilatation is complete and the labor has entered the second stage the accessory forces of labor, or voluntary effort on the part of the mother, may be brought into play. This should be carefully abstained from until this time. The observant obstetrician will note by rectal examination whether, as dilatation becomes complete, a bit of cervix becomes caught between the head and the symphysis. This is more likely to happen in posterior positions as the head does not fit as well into the cervical ring. If this occurs it may delay the labor considerably and, as time goes on, it becomes edematous and thick and is less easy to deal with. It should be gently pushed upward by the fingers during a pain when, but not before, the cervix is otherwise entirely gone. If the incarceration of the anterior cervical lip between the head and the symphysis is allowed to remain unrelieved the anterior portion of the cervix may be pushed downward by the advancing head. This produces a strain on the anterior vaginal wall and is a potent cause of cystocele. Its relief assists the progress of labor, in some cases considerably.

It is with the cases which do not progress so favorably that I am particularly concerned at present. There are a considerable number of cases in which some form of operative assistance is needed. While hastiness in proceeding to operative measures is not wise, it is not to be forgotten that unreasonable prolongation of the second stage may have serious consequences. Among these the development of a contraction ring may be mentioned and emphasized.

Under some form of pain relief, the best at this stage of labor being gas and oxygen analgesia, labor is allowed to continue. The pains are often less effective than in anterior positions and the head tends to lie higher. It is hoped that the head may be caused to descend through the pelvis upon the perineum, and to rotate anteriorly. Should this occur spontaneous delivery or an outlet forceps terminates the delivery. This occurred in 65.4 per cent of this series of cases.

Should failure of anterior rotation occur, or should the head rotate anteriorly only part way and come to rest in the transverse position, the aid of art becomes necessary. Various methods of dealing with this situation have been suggested. Some obstetricians prefer rotation with forceps while others believe that version should be used in

a far larger proportion of cases than it has been in most clinics heretofore.

In our own work we have found very useful a method of manual rotation differing somewhat from those usually described but resembling most closely the maneuver suggested many years ago by Tarnier. After waiting for the head to become engaged and for any necessary moulding to occur, and this is essential to success, the right hand is introduced and the head grasped with the fingers and thumb which are spread out as much as possible in order that such force as may be

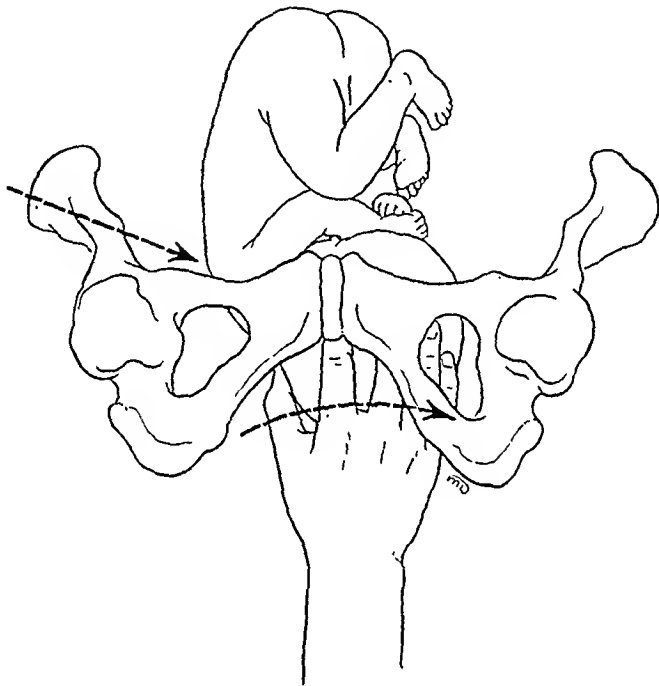


Fig. 1.—Manual rotation. Head grasped by whole hand (right) and rotated to anterior position. The left hand (upper arrow) pushes the shoulder toward the woman's left, aiding the rotation.

used shall be distributed as widely as possible over the fetal head. At the same time the left hand is applied to the mother's right lower flank, as nearly as possible under the fetal shoulder. Simultaneously the hand within the vagina grasping the head, and the external hand, rotate the head and body to the mother's left. For success in this maneuver it is necessary that the uterine musculature be relaxed with ether. Gas anesthesia may be resumed, if desired, as soon as rotation has been accomplished.

It is advisable to overcorrect the head if possible, that is, to continue the rotation until the occiput has just passed the median line. The thumb of the internal (right) hand is then withdrawn, the tips of the fingers being left in contact with the lower part of the child's face in order to prevent backward rotation into the original position. At this point the operator's left hand leaves the abdomen of the

mother and is replaced by the hand of an assistant or nurse. This replacing hand may be applied under the sterile sheets without disturbing asepsis. The left blade of the forceps is then introduced by the operator with his left hand, passing the blade inside the fingers of the right hand which still remains in place. After this blade is introduced an assistant holds the handle, at the same time exerting gentle traction laterally. This causes a gentle lever action to be produced, the blade of the forceps causing pressure against the child's face in place of the operator's hand, thus hindering backward rotation. The

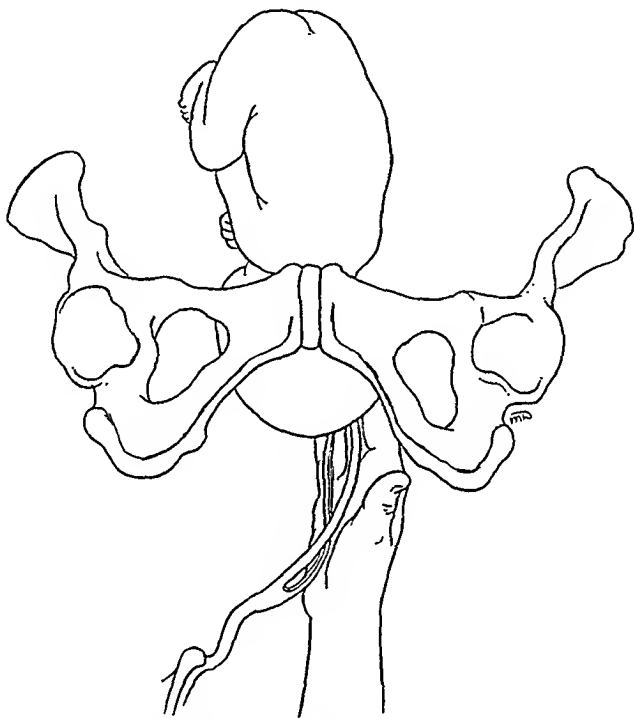


Fig. 2.—Anterior rotation complete. Right hand maintains head in anterior position while left blade of forceps is applied.

right blade is then introduced and the blades closed. With one or two fingers the operator assures himself that the occiput remains anterior. Extraction may now be done.

Should the position be a left occiput posterior a similar procedure is carried out, again using the right hand. The internal part of the rotation is done in a similar manner though in the opposite direction and after rotation has been accomplished it is usually best to make pressure with the fingers of the internal hand against the lateral aspect of the occiput rather than the lower part of the face in order to prevent backward rotation into the left posterior position. The external manipulation is done by using the left hand, the operator reaching across the mother's lower abdomen and trying to hook the fingers under the shoulder on her left side, and pulling rather than pushing as the internal rotation goes on. The forceps application is the same.

If possible the rotation is done without pushing the head upward. If this is impossible one need not hesitate to disengage the head, as, any necessary moulding having occurred, it will reenter the pelvis. It should be emphasized again that this maneuver is not to be carried out until the head is well into the pelvis and moulding, if necessary, has occurred. The inexperienced obstetrician should beware lest the apparent descent of a markedly moulded head, and this impression may be increased by the presence of a caput succedaneum, may cause him to assume that the head is much deeper in the pelvis than it really is. An error of this sort may lead to unexpected operative difficulties.

Disengagement of the head must of course only be done when success is impossible without it. When it is necessary, the operator must always be on the lookout for the possible prolapse of the cord. This occurred once in the series which forms the basis of this paper. Immediate version and extraction was done and the child lived.

If the head is not engaged, and it appears necessary to intervene, version should be chosen instead of manual rotation and forceps unless cesarean section is indicated.

TABLE I.—SPONTANEOUS OR FORCEPS DELIVERIES

	Total Number	285	
Spontaneous rotation and delivery	83	29.1%	
Spontaneous rotation and forceps	104	36.3%	
Manual rotation and forceps	76	26.6%	

The procedure described above has been done in 76 cases of the series which forms the basis of this report. It was attempted and failed of success in 9 cases. In these cases version was done at once. In 8 other cases version was done without any attempt to do a manual rotation. ✓ Simple outlet forceps after spontaneous rotation was done 104 times.

No maternal death occurred. As to morbidity, any woman whose temperature rose to 100.4° at any time was included in the morbidity list. This occurred in 10 cases after manual rotation, or 15.1 per cent. This is a severe standard by which to judge and gives a higher morbidity rate than the more lenient standards which are ordinarily used. There were seven versions (41.1 per cent) and 18 spontaneous or low forceps deliveries (11.3 per cent) with fever.

In this series only one fetal death occurred. This was a premature baby, delivered spontaneously after a rapid labor at seven months' gestation. There were no infants injured.

We prefer the method of manual rotation and forceps to forceps rotation for the following reasons:

1. By using the hand the operator is able at all times to know whether the head is responding to manipulation or not.

2. Should the first grip of the head be imperfect, and should the operator feel the skull giving or bending under his fingers, the grip can be altered or shifted a little to prevent this.

3. If rotation is not easily accomplished at the level at which the head is found, the head may easily be shifted upward, or disengaged if necessary. If disengagement is found necessary, prolapse of the cord must be watched for.

4. There is a notable freedom from the deep upper vaginal tears which are rather likely to occur in forceps rotation.

5. By the method described, only the right hand is used, regardless of the side upon which the occiput lies. This permits the introduction of the left blade of the forceps first in all cases and obviates the awkward readjustment of the handles of the instrument when the right blade is introduced first. It reduces intravaginal manipulation to a minimum. The use of tenacula or other instruments to hold the occiput in the anterior position is unnecessary. The assistance of the external hand is of great value.

It should be emphasized that the following conditions, in addition to those usually given in standard textbooks for forceps, should obtain before proceeding to manual rotation and forceps:

1. The head must be engaged. If moulding is necessary this must already have occurred.

2. The second stage should not have been allowed to proceed so long that a contraction ring has formed.

3. Ether anesthesia is requisite for the production of relaxation of the uterine musculature. With the lesser degree of relaxation accompanying gas anesthesia, success is much more difficult of attainment. The administration of ether may be preceded and followed by ethylene or nitrous oxide, so that the duration of ether anesthesia may be only a matter of a few minutes. After rotation is accomplished we return to ethylene.

CONCLUSION

This maneuver has been in use in our maternity for a number of years. Since becoming accustomed to it we have ceased to regard the posterior occipital position with dread, as we feel that in nearly all cases, should anterior rotation fail to occur spontaneously, we can deal with the situation successfully. We have been pleased with the absence of infant mortality and of severe maternal injury. While the method requires a certain amount of dexterity it seems that the results which may be attained by its use will well repay the trouble expended in its acquisition.

PUERPERAL GANGRENE OF THE EXTREMITIES*

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ALTHOUGH puerperal gangrene of the extremities has been discussed a number of times in the literature, its rarity justifies the addition of another case to the relatively few already reported.

In 1916, Stein reported two cases and reviewed the literature up to that time, when 71 cases had been reported in the puerperium, and five after gynecologic operations. In 1925, he again reviewed the literature and discussed 10 cases, reported since his last article. Four of these followed operations and 6 were in the puerperium, making a total of 77 cases of gangrene following abortion or labor. Since 1925, reports have been made of 22 cases in the puerperium, making a total of 99 cases, or with the present one, 100. We add this to Stein's table, which was published in 1925.

	UP TO 1916	1916-1925	SINCE 1925	TOTAL
Puerperal Gangrene				
(Lower Extremities)	53	4	15	72
Gangrene after Abortion				
(Lower Extremities)	3	1	8	12
Puerperal Gangrene				
(Upper Extremities)	10	1	0	11
Gangrene after Abortion				
(Upper Extremities)	1	0	0	1
Gangrene During Pregnancy	4	0	0	4
Total	71	6	23	100

The etiology of the condition has been fully discussed by Stein in both his articles, but it is mentioned again, because of the 17 cases in the German literature since 1925. Gynergen or other ergot preparations are mentioned as etiologic factors in 12 of them. In all the cases but one, fever or other evidence of infection was present.

This was Kienlin's case, which had thrombosis of both femoral veins and angioneurotic edema. Newmann's patient had "septic endometritis," but examination of the amputated leg showed no thrombi or emboli, only marked contraction of the arteries. Moskovitz states that his case showed definite signs of ergot poisoning, also a puerperal infection, and the gangrenous lesion was similar to that in our case, which received no ergot. It is impossible, of course, to say that the ergot was not the cause in these cases, but the presence of infection, plus the rarity of ergot poisoning, make it somewhat questionable, hence they are included.

*Read before the St. Louis Gynecological Society, March 13, 1931.

Infection is the one etiologic factor present in all cases and results in vessel obliteration and gangrene. Stein's classification brings this out.

The case here reported is particularly interesting since it is the only one following cesarean section. Other unusual features are the type of pelvic deformity, the development of infection after a Porro operation in a clean case, and the isolation of anaerobic streptococci from metastatic abscesses.

The patient was forty-two years of age, and had had two previous sections seven and six years ago on account of narrow pelvis. Complete x-ray studies of all the bones showed osteitis deformans involving pelvis, upper halves of both femurs,



Fig. 1.—X-ray of pelvis.

spine, right humerus, left fourth metacarpal, frontal and parietal bones. The pelvic deformity, as seen in the illustration, is a marked narrowing of the inlet. The only complication during pregnancy was an increasing edema of both feet and legs during the last two months. The patient entered the hospital at term, in labor. At this time the edema was extreme. One vaginal examination was made. Cesarean section with supravaginal hysterectomy was done with considerable difficulty, owing to adhesions from previous operations. An adherent loop of intestine at the upper end of the incision was cut and not noticed until closure. This was repaired. The patient left the operating room in poor condition and steadily became worse in spite of intravenous glucose, etc. Two and one-half hours after the operation, the blood pressure dropped to 58 systolic, when the patient was transfused, following which her condition was satisfactory. No signs of peritonitis developed, but a mass appeared in the right lower quadrant the size of a grapefruit, which was slowly absorbed. This was evidently a hematoma and may have been responsible for her shock. The day following the operation, the temperature rose

to 39.5° C., and remained between this point and 38° for thirty-two days. It then remained below 38° for sixteen days and subsequently rose to between 38° and 39°, returning to normal 60 days postoperative. The first rise was due to the gangrene and abscesses of the leg, and the second, to the abscess of the thigh.

On the fourth postoperative day, a bluish discolored area, slightly larger than a silver dollar, appeared on the dorsum of the right foot. The next day the area was definitely dry gangrene. On the seventh day, an identical, but slightly smaller area was evident on the left foot. A week later, the sloughs were easily lifted off, leaving clean ulcers and showing that the process had involved the entire thickness of the skin. The edema subsided rapidly following the appearance of the gangrenous areas. While gangrene was present, palpation of the terminal vessels was difficult. The popliteal and posterior tibials were felt, but there was some question about the

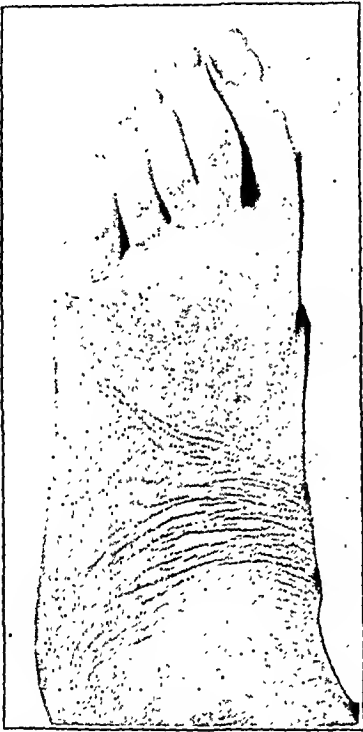


Fig. 2.—Left foot seven days postpartum.



Fig. 3.—Same foot two days later, showing gangrene. Similar lesion on right foot.

dorsalis pedis. After the edema had disappeared these also were felt. The ulcers healed without difficulty.

On the seventh day the patient developed signs in the right lower lobe of the lung, which were diagnosed pneumonia, but in view of the gangrene and metastatic abscesses, it is entirely possible that this was an infarct. This cleared up, but left some fluid, which was still present at the time of discharge.

Sixteen days postoperative, the skin over the anterior, lateral, and posterior surfaces of the lower third of the right leg became discolored and swollen, and presented much the same appearance as the skin over the dorsum of the feet, before it became gangrenous. However, this developed into three localized abscesses, which were opened eight days later, and from which pure cultures of an anaerobic streptococcus were obtained.

On the forty-second day, the medial surface of the upper third of the right thigh became painful, swollen, and very hard. Eighteen days later, a deep abscess was

opened and about 200 c.c. of pus obtained, cultures of which showed the same organism found in the abscesses of the leg. The temperature immediately dropped, and recovery was rapid. The patient was discharged on the eightieth day.

We believe the lung condition can be accounted for by an embolus from a pelvic thrombophlebitis and the abscesses, by bacterial thrombi. The gangrene was of the dry type and evidently due to complete obstruction of a very small artery, either by an embolus, which passed through the pulmonary circulation, or the development of an arteritis from bacteria with thrombosis and obliteration.

Brief abstracts of the 22 additional cases noted in the literature since 1925 follow:

Toll.—Aged twenty-six, gravida 9, spontaneous delivery. Up on fourth day. On fifth day chills and fever. Gangrene of both legs to just below knees. Amputation, recovery. Examination of legs showed arteries empty, veins filled with bloody viscous fluid. Condition attributed to arterial obstruction from endarteritic changes brought on by infection.

Entwisle.—Aged forty-four. Premature delivery at seven months. Chills, first two weeks postpartum. Gangrene of left leg to knee. Death.

King, Miller and Houser.—Aged thirty-seven, gravida 10. Normal delivery. No fever. Gangrene of both feet and legs, extended in spite of amputation, and patient died on table from pulmonary embolism when amputation at hip was being performed. Autopsy showed thrombosis of aorta from 1.5 cm. above the bifurcation, down.

Hicks.—Aged twenty, gravida 3. Normal delivery. Onset four weeks postpartum with edema. Two weeks later gangrene to knees. Amputation, recovery. Legs showed thrombosis of anterior and posterior tibial arteries and thrombi in all veins.

Portteus.—Aged twenty-five, gravida 1. Long labor, twins, hemorrhage, shock. Chills and septic temperature. Four weeks postpartum moist gangrene of both feet. Double amputation on fifty-second and fifty-sixth days. Death on eighty-seventh day from pneumonia.

Behne.—Aged thirty-seven, gravida 9. Spontaneous delivery. Twelve days postpartum gangrene of right leg developed, amputation. Death on thirty-fifth day. Autopsy showed thrombosis of right anterior and posterior tibial arteries, general peritonitis, mitral stenosis with thrombotic endocarditis doubtless causing the lesion in the leg.

Bartels and Estrin.—Aged thirty-seven, gravida 7. Premature delivery. Chills and fever during labor, amniotic fluid foul. Gangrene of left leg. Amputation at upper third of thigh on twentieth day. Discharged in good condition, seventy days later. Leg showed thrombi in arteries and veins. A facultative anaerobe and a short gram-positive bacilli, similar to Franke's gas bacillus, were found in the leg.

Pall.—Aged thirty-two, gravida 6. Entered hospital with infected incomplete abortion. Blood culture positive for hemolytic streptococci. Five days later whole right leg cool and cyanotic, and beginning to show gangrene. Died before line of demarcation formed. Autopsy findings: septic endometritis; thrombus 5 cm. long in femoral artery, containing many bacteria.

O. Schmidt.—CASE 1.—Aged twenty-three. Cured and packed outside of hospital. Entered hospital with appearance of sepsis. Six days later both hands and feet became livid and cool. Portions of toes sloughed off. Lost all toes but one on right foot and three from left. Hands recovered.

CASE 2.—Aged thirty-eight. Cured eight days after supposed abortion, but later found by culdesac puncture to have tubal pregnancy. Fever for four days. Patient was up on eleventh day. One week later she collapsed from lung emboli.

In a few days gangrene of right leg at knee. Amputation and death. The leg showed embolus in femoral artery.

The following cases are those in which gynergen or ergot were used.

O. Schmidt.—CASE 3.—Aged twenty-six, gravida 2. Spontaneous delivery. Slight fever. On ninth day temperature 39° C. Hands and feet painful and blue. Hands recovered, but there was superficial gangrene of toes of one foot. Patient was given gynergen, 1 c.c. after delivery and one tablet per day for first six days.

Kienlin.—Aged thirty-four, gravida 2. Spontaneous delivery. On eleventh day, thrombosis of both femoral veins. On eighteenth day right foot discolored and no pulse felt in right tibial artery. Six days later, blisters on right leg. Spontaneous recovery. Condition explained on basis of gynergen and angioneurotic edema.

Neumann.—Aged twenty-three. Entered hospital with chills following criminal abortion. Had had rheumatism and endocarditis for twelve years. Septic endometritis and parametritis. Gangrene of left foot and leg to knee developed. Amputation and recovery. Leg showed no thrombi or emboli, only marked contraction of arteries. Received 5 mg. of gynergen by injection twice daily for six days and six tablets daily for nineteen days.

Simonovitis.—Spontaneous febrile abortion. On fifteenth day gangrene of two toes. Conservative treatment and recovery. Gynergen given three times daily for four days.

Moskowitz.—Aged thirty-five, gravida 2. Spontaneous delivery after thirty-six hours' labor. Puerperal fever. For six days "Sekalfliudextrakt" was given three times daily (0.375 gm.), followed by definite signs of ergot poisoning, collapse, weakness in limbs, itching, etc. No pulse in radial, popliteal, or arteries of feet. Superficial gangrene appeared on backs of feet and toes. Complete recovery in ten weeks. The lesion in this case is similar to ours in which no ergot was used.

Speizer.—Aged twenty-five, gravida 2. Marked varicosities and edema of legs. Postpartum hemorrhage. Septic fever on tenth day with double pelvic masses. On seventeenth day, no pulsation in right dorsalis pedis artery. On twenty-eighth day foot discolored. On thirty-third day died of peritonitis. At autopsy, there was gangrene and thrombosis of femoral and dorsalis pedis veins. Patient received 8 c.c. gynergen after delivery and three tablets daily for five days.

Lork.—CASE 1.—Aged thirty-two, multipara. Normal labor. Febrile puerperium. Gangrene of both feet and amputation on thirty-eighth day. Recovery. Given one tablet gynergen three times daily, total dose equivalent to 36 mg. "ergotamin."

CASE 2.—Aged thirty-four, gravida 2. Spontaneous delivery. Manual removal of placenta from bicornuate uterus. Febrile puerperium. Gangrene of right foot. Amputation and recovery. Gynergen three times daily for thirteen days (equal to 39 mg. "ergotamin").

Goldberger.—Aged twenty-six, gravida 4. Febrile abortion. Intraperitoneal streptococcus abscess drained through culdesac on seventh day. Parasthesia of both legs developed, followed by disappearance of popliteal and dorsalis pedis pulses. Periarterial sympathectomy done on left side, which became worse than the right. Slow recovery over period of months. The capillary microscope showed affections of the vascular nerves. Patient had been given 1 cm. gynergen daily and 12 drops three times daily by mouth.

Caffier.—Aged twenty-five. Several pieces of retained placenta removed. Fever. On twenty-second day feet cool and edematous. Two weeks later both feet bluish black except one great toe. One week later line of demarcation at edge of toes. Second and fifth toes of right foot dropped off. On left, all toes recovered but one. Ergot had been given for nineteen straight days.

Brandies.—Aged twenty-two. Entered hospital with chills and fever after injecting soap solution into uterus. Aborted spontaneously next day. Black dis-

coloration continued from feet up to middle of leg. Portions of skin fell off, exposing tendons. Treated conservatively and recovered. One c.c. of gynergen given after abortion and two tablets a day for three days.

Heyer.—Aged twenty-four, multipara. Abdominal pain and fever three weeks before entering hospital. Four days later early placenta removed from uterus with finger. Eight days later discoloration of feet and lower third of legs. Eight days later a line of demarcation two fingerbreadths above malleolas in left and three on right. Double amputation. Recovery. Only findings in arteries were marked contraction and narrowing of lumen. Occasional organizing thrombus in veins. Three tablets of gynergen were given daily for several days. Author feels that the small amount of gynergen could not be responsible because patient had a neurospastic diathesis, for frequently her hands and feet would fall asleep.

The two following cases are abstracted, because they occurred during the puerperium; but, they are not included in the totals, because it seems unlikely that the delivery or abortion was responsible for the lesions, and the authors definitely attribute them to other causes.

Stevens.—Aged thirty-one, gravida 3. Normal delivery. Pain and burning in right index finger three weeks before delivery. Gangrene six days postpartum. Amputation. Recovery. Patient had no signs of infection and author attributes case to endarteritic changes.

Polano.—Aged thirty-six. Abortion done at three months for tuberculosis. Radial pulse not palpable on seventh day. On the fourteenth day gangrene of fingers of left hand. After two years a griffen claw contraction of two fingers occurred. A diagnosis of beginning Raynaud's disease was made by neurologists. Received one tablet of gynergen three times a day for five days.

SUMMARY

Puerperal gangrene is a rare and serious complication.

The lower extremities are most frequently involved.

It is due to obliteration of the circulation of the affected part, arterial or venous.

Infection is the common etiologic factor.

With the use of gynergen, an increasing number of cases are reported in the German literature.

It is questionable whether gynergen is the primary factor, because in all the cases but one there was infection.

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BLOOD GUANIDINE BASE CONCENTRATION IN ECLAMPSIA

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PARATHYROIDECTOMY in animals is accompanied by retention of guanidine in the blood, as shown by Paton and Findlay,¹ Burns,² and Bayer.³ An increase in blood guanidine concentration has also been found in active tetany in children² and in arterial hypertension.^{4, 5} Watanabe^{6, 7, 8, 9} reported studies on the influence of administration of guanidine bases upon the blood-sugar content and upon urinary ammonia and acid excretion. He found that the subcutaneous injection of a 10 per cent solution of guanidine hydrochloride into rabbits induces symptoms almost identical with those of tetania parathyreopriva, as well as a hypoglycemia. This author suggests that the hypoglycemia following parathyroidectomy may be due to the action of guanidine, which increases in the blood under these conditions. He further found, following the administration of guanidine, an excess of ammonia, and a decrease in acid elimination in the urine, resulting in severe acidosis with retention of phosphates and a decrease of calcium in the blood; and concludes that it is possible that the fundamental cause of tetany is the increased formation of guanidine nitrogen brought about by a disturbance in the function of the parathyroid.

Major and Weber⁴ reported slight increases in blood guanidine in patients with arterial hypertension, and quite marked guanidine retention in severe chronic nephritis and uremia. Major cautiously concludes that certain hypertensives show in their blood an increased amount of some substances giving the same color response as guanidine and having certain chemical properties similar to those exhibited by the guanidine bases.

Recently Ellsworth¹⁰ observed an increase in blood guanidine in patients with arsphenamine jaundice, in which diffuse liver damage is known to occur, as well as in patients with Laennec's cirrhosis of the liver. Minot and Cutler¹¹ had previously shown that dogs, fed on a meat diet low in calcium, are very susceptible to carbon tetrachloride poisoning, and that the administration of calcium, after intoxication had started, usually cured the condition. They further found that the liver necrosis produced by carbon tetrachloride or chloroform was accompanied by a hypoglycemia and by a retention of guanidine in the blood. In an investigation upon acute liver injury,¹² these authors concluded that in certain types of liver disease and also in eclampsia, the same abnormalities in blood chemistry, namely increased guanidine and hypoglycemia, are present as in their dogs with carbon tetrachloride and chloroform intoxication. They further stated that calcium medication gave prompt relief in their patients with preeclamptic toxemia, eclampsia, and liver disease.

Since the work of Major and Weber,⁴ on blood guanidine in hypertension, we have been interested in the guanidine bases in eclampsia

and have routinely made guanidine determinations on the blood of our eclamptic patients during the past three years.

METHODS

We employed the method of Major and Weber.⁵ In a personal communication, Major states that he has good evidence to believe that the color reaction in this method is due to a guanidine compound, although it is difficult to say positively that it is methyl guanidine. Major and Weber suggested that a creatine correction should be made, and we have accordingly determined creatine and creatinine both on the original Folin-Wu filtrate, as well as on 2 c.c. of extract set aside for that purpose, as they suggest. In our determinations the final creatine figures on the extract were usually lower than those on the original filtrate, and because of that discrepancy we have not applied the correction to the guanidine values.

Blood-sugar determinations were made by the Benedict method of 1925,¹³ CO₂-combining power by the van Slyke procedure, nonprotein nitrogen and uric acid by the methods of Folin,^{14, 15} and the chlorides by the method of Whitehorn.

In Table I are reported the nonprotein nitrogen, uric acid, sugar, CO₂-combining power and guanidine values in the blood of normal pregnant women at term. The blood sugar in these patients ranged between 67 and 81 mg., with an average of 73 mg. per 100 c.c. It should be noted that by the method of Benedict, which we employed, the normal blood sugar is about 75 mg. per 100 c.c. of blood. The "guanidine" values ranged between 0.22 and 0.40 mg., the average being 0.33 mg. per 100 c.c. of blood. The other blood constituents reported are in agreement with the figures given in earlier publications.¹⁷

TABLE I. NORMAL PREGNANT WOMEN AT TERM

CASE NO.	NONPROTEIN NITROGEN	URIC ACID	SUGAR	CO ₂	GUANIDINE
1	33.1	3.0	67	46.6	0.22
2	28.2	2.8	76	45.7	
3	27.0	2.8	69	44.7	0.38
4	28.5	2.0	71	46.6	
5	30.6	2.7	81	50.4	0.40
Average	29.5	2.7	73	46.8	0.33

The same blood constituents were also studied in 23 eclamptic patients during the past three years. The findings are recorded in Table II. All values are given in mg. per 100 c.c. blood, except the CO₂-combining power which is reported in volumes per cent. In this work we still used the original Folin-Wu filtrate and consequently the figures are for laked blood, although Folin¹⁶ recently suggested the use of unlaked blood.

From a comparison of the findings in eclampsia with those in normal pregnant women at term, we must conclude that our eclamptic patients did not show a definite or marked increase in blood guanidine, nor a hypoglycemia; and in this respect our results are at variance with those of Minot and Cutler. It should be noted that the

eclamptic patients show an increased uric acid content in the blood and a decreased CO₂-combining power.

TABLE II. ECLAMPTIC PATIENTS

CASE NO.	NONPROTEIN NITROGEN	URIC ACID	SUGAR	CO ₂	GUANIDINE
6	28.5	3.2	105	50.2	0.39
7	61.8	8.6	82	29.1	
8	33.3	6.1	73	35.6	
9	34.5	9.4	87	50.5	
10	32.5	11.4	80	38.8	
11	35.3	4.7	75	31.8	0.29
12	41.9	5.6	89	35.7	
13	29.7	4.0	59	49.2	0.40
14	46.0	9.2	50	38.5	
15	34.9	6.1	58	45.5	
16	46.0	4.8	98	40.0	
17	35.0	7.0	167	24.0	
18	39.5	6.0	167	22.1	
19	40.0	3.9	91	51.3	
20	37.5	4.4	61	48.5	0.26
21	31.6	6.1	105	30.3	0.38
22	30.0	3.8	47	47.5	0.39
23	32.1	4.5	55	44.7	0.28
24	38.7	5.6	66	38.1	0.49
25	54.6	3.6	93	39.0	0.58
26	26.1	4.0	69	39.5	0.48
27	29.3	6.7	109	33.4	0.32
28	40.0	7.0	130	41.9	
Average	37.33	5.9	87.7	39.3	0.39

The second part of this paper deals with experiments on sixteen rabbits. Blood was drawn from the ear vein before and after the intravenous administration of 10 per cent solutions of guanidine hydrochloride or sulphate, or of methyl guanidine sulphate. Nonprotein nitrogen, urea nitrogen, chlorides, uric acid, sugar, guanidine and CO₂-combining power were determined on all blood specimens, by the methods of analysis employed above, while urea nitrogen was determined by van Slyke-Cullen modification of the Marshall method.

TABLE III. BLOOD CHEMISTRY OF NORMAL RABBITS

RABBIT NO.	NONPROTEIN NITROGEN	UREA NITROGEN	URIC ACID	CHLORIDES	SUGAR	CO ₂
7	43.6	19.6	0.7	447	75	37.5
12	46.8			419	109	40.8
13	50.0		0.8	446	95	48.5
16	35.7	12.3	0.7	432	108	54.2
Average	44.0	16.0	0.7	436	97	45.2

At the conclusion of the experiment the animals were sacrificed in order that the various tissues might be studied histologically. The chemical and histologic findings are summarized in Table IV, which should be compared with Table III, giving the findings on four normal rabbits.

TABLE IV. RABBITS—GUANIDINE ADMINISTERED

NO.	WEIGHT	DATE	GUANIDINE INJECTED	TIME OF VENIPUNCTURE	NON-PROTEIN NITROGEN	UREA NITROGEN	URIC ACID	CHOL-ESTEROLS	SUGAR	CO ₂	GUANIDINE	CONDITION AND PATHOLOGY
1	2050	3/ 8/29	0.25 gm. hydrochloride per kilogram at 10 A.M.	9:30 A.M. 11:00 A.M.	43.6 44.1	19.6 20.1	0.7 0.8	447 405	75 80	37.1 30.0	0.2	Comatose after injection. Killed at 11:30 A.M. Liver normal.
8	2300	3/22/29	0.26 gm. hydrochloride per kilogram at 11:45 A.M.	11:10 A.M. 12:35 P.M.	44.6 84.8		0.7 1.1		86 118	34.0 11.4		Muscular twitclings after injection. Coma. Death at 1:15 P.M. Liver normal.
9	3405	3/26/29	0.05 gm. methyl guanidine sulphate per kilogram at 10 A.M. Injection repeated, same dosage, on 5 successive days.	9:30 A.M. 3/26/29 11:40 A.M. 4/ 6/29	39.1 38.7				100 88	42.1 39.4		No symptoms over 10 days of experiment. Killed 4/6/29. Liver showed generalized fatty infiltration. No necrosis. Kidneys normal.
10	1500	3/26/29	0.1 gm. hydrochloride per kilogram at 10 A.M. Injection repeated, same dosage, on five successive days.	9:00 A.M. 3/26/29 Clotted								No symptoms or signs. Killed at 11:10 A.M., 4/10/29. Liver normal. Kidneys normal.
14	2500	4/ 5/29	0.35 gm. methyl guanidine per kilogram at 11:05 A.M.	11:00 A.M. 4/10/29 10:40 A.M.	126.0 58.8	66.7	0.9 1.6	619 447	86 121	26.6 38.2		Had several convulsions immediately after injection. Killed at 11:15 A.M., 4/5/29. Liver showed moderate central fatty infiltration. Round cells about bile ducts.
6	2000	3/20/29	0.25 gm. sulphate per kilogram at 10:00 A.M.	11:10 A.M. 9:30 A.M. Clotted	138.0		1.7	389	140	40.1		Convulsions immediately after injection. Coma. Killed at 11:59 A.M., 3/20/29. Liver showed fatty infiltration with moderate central necrosis.
				11:55 A.M.	85.6		2.4	439	200	9.1		

DISCUSSION OF FINDINGS

The results recorded in Table IV show a lowering, sometimes very marked, in the CO_2 -combining power following the intravenous injection of guanidine in rabbits. Shortly after the injection, the blood sugar may show a hyperglycemia, as was also demonstrated by Watanabe, and later a hypoglycemia. In our experiments we did not follow the blood sugar at frequent intervals over a long period of time, as the findings of Watanabe in this respect are quite conclusive. He found that in all his rabbits hypoglycemia developed several hours after the administration of guanidine. The other blood constituents studied by us revealed nothing abnormal except that in several of the animals the nonprotein nitrogen and urea nitrogen were elevated, while the blood chlorides decreased in two and increased in one animal following the injection.

The histologic study of the liver showed that the administration of guanidine produced no lesion comparable with the accepted eclamptic peripheral necrosis. Indeed, in most of our animals the liver was normal, or at most revealed a generalized fatty infiltration.

Returning to the findings in the blood constituents in eclampsia as recorded in Table II, we note that the disease is accompanied by a normal or slightly elevated nonprotein nitrogen, an increase in uric acid, a normal or increased blood sugar, a decrease in the CO_2 -combining power and a normal "guanidine" content. It should be remembered that in the blood-sugar determinations we employed the 1925 Benedict method, which gives a normal of about 75 mg. per 100 c.c. blood. Our average is 73 mg. for normal pregnant women at term, as compared with 87.7 mg. in eclamptic patients, while in only 9 of the latter did the blood sugar fall below 75 mg. The lowest blood-sugar value in our eclamptic patients was noted in Case 22, where it was 47 mg. It must be pointed out, however, that we occasionally have encountered equally low values in normal pregnancy. On the basis of our findings, we cannot agree with Minot and Cutler that there is a tendency to hypoglycemia and a definite elevated blood guanidine in eclampsia, as in our cases normal blood sugar or an actual hyperglycemia is seen far more frequently than hypoglycemia.

Minot and Cutler,¹² finding hypoglycemia and elevated blood guanidine values in eclampsia report the successful use of intravenous administration of calcium (Sandoz Company's sterile ampules) in a few patients suffering from this disease. Contrary to the reports of these authors, Watanabe⁷ found that in animals with guanidine hypoglycemia injection of calcium lactate failed to restore the blood-sugar content to normal.

As long ago as 1923 we tried calcium therapy in the treatment of eclampsia on the basis of a suspected decrease in this cation in the

blood of patients suffering from the disease. In this connection the following protocol may be of interest:

Patient M. B-11, J. H. H. history No. 12,513, a sixteen-year-old colored primipara at term was admitted May 31, 1923, after having one convulsion. Diagnosis: ante-partum eclampsia; confirmed later by autopsy.

5/31/23	B. P. 150/100	2nd convulsion.
6/ 1/23	B. P. 170/120	3rd convulsion. Labor started at 7:00 P.M.
6/ 2/23	B. P. 170/110	4th convulsion. In labor.
6/ 3/23	B. P. 170/110	5th to 13th convulsion. Delivered, low forceps.
6/ 4/23	B. P. 160/100	13th to 21st convulsion. Unconscious since delivery.
6/ 5/23	B. P. 140/ 60	21st to 37th convulsion. Death at 6:10 P.M.

The following note, written by the author, is taken from the history: "6/5/23: Analyses on patient's serum showed the following:

Na	370.0 mg. per 100 c.c. serum
K	31.0 mg. per 100 c.c. serum
Ca	9.1 mg. per 100 c.c. serum
Mg	2.5 mg. per 100 c.c. serum

From these figures it is evident that the ratio $\frac{[Na] + [K]}{[Ca] + [Mg]}$ is increased over normal. With this in view it was thought advisable to give the patient calcium chloride with an idea of reducing this ratio. Since she was in coma, it was necessary to administer the $CaCl_2$ intravenously. Four injections, two on the fourth and two on the fifth of June were given. The total Ca given was 1.21 gm. This raised the Ca in the serum to 10.1 mg. per 100 c.c." We had a similar experience in another case in 1924.

Subsequent work¹⁷ on the cation ratios in eclampsia has convinced us that calcium therapy is not necessary to attempt to restore these ratios to normal, as the disease is accompanied by no abnormal shift in any of the ratios, except a slight increase in $\frac{[P]}{[Ca]}$ due mainly to a slight increase in phosphorus. Furthermore, calcium therapy does not seem indicated in this disease on the basis of blood sugar or blood guanidine content, as hypoglycemia and increased blood guanidine content are not the usual findings in eclampsia.

CONCLUSIONS

1. Blood "guanidine" is not markedly elevated in eclampsia.
2. Hypoglycemia is not a usual accompaniment of eclampsia.
3. Intravenous administration of guanidine in the rabbit in doses ranging from 0.05 to 0.25 gm. per kilogram of body weight, does not produce liver necrosis.
4. Calcium therapy in eclampsia does not appear rational on the basis of blood guanidine, blood sugar, or blood cation ratios.

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A PROPOSED MODIFICATION OF THE ASCHHEIM-ZONDEK "PREGNANCY TEST"*

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BEFORE presenting our modification of the Ascheim-Zondek reaction, in view of the large amount of experimental work that has been done concerning the function of the anterior pituitary lobe, it seems advisable to abstract the literature in order to obtain a chronologic review of the results.

* * * * *

Thus far no reference has been found in the literature on the use of blood serum intravenously in rabbits, followed by observation of the ovaries at operation or autopsy for any reaction from the anterior pituitary hormone. Apparently absorption of the hormone from the anterior lobe of the pituitary is directly through its vascular supply. It seems logical to expect a rather constant hormone level in the blood stream since any excess may be liberated through the kidney.

In our laboratory a series of 23 rabbits weighing from 600 to 1,700 gm. was injected with 5 c.c. of urine from various cases. Autopsies were performed between seventeen and one-half and forty-nine hours after injection and the earliest time at which definite hemorrhagic follicle formation was observed was thirty and one-fourth hours. Of 13 known cases of pregnancy, 5 gave positive reactions grossly; 6 cases were examined at or before twenty-four hours after injection and did not give a positive reaction grossly, but all were positive on microscopic examination; 2 rabbits injected with urine from a case at term showed doubtful reactions grossly after forty hours, but were positive micro-

*Presented as a preliminary report at the St. Louis Medical Society, December 16, 1930.

NOTE: For lack of space it is not possible to print Dr. Brown's article in full. The complete paper is published in the author's reprints. The elided paragraphs are marked by * * * * *.—Editor.

seopically. Nine cases not pregnant gave no reaction. One rabbit died forty-five minutes after injection. The doubtful reactions were largely due to the examination of the ovaries at too early a time, because in some of the duplicate animals allowed to go for a longer time, the reaction was definitely positive. It is probably best to examine the ovaries between thirty-six and forty-eight hours after injection by this method. The results would have been more constant if older rabbits had been used.³⁵

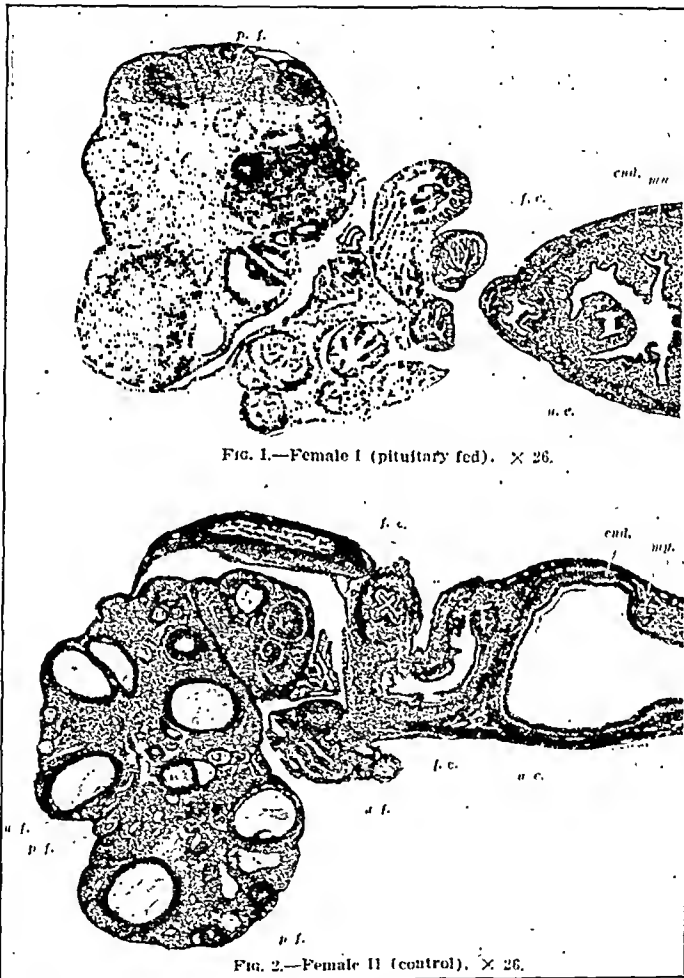


FIG. 1.—Female I (pituitary fed). $\times 26$.

FIG. 2.—Female II (control). $\times 26$.

Fig. 1.—Reproduction from article by Emil Goetsch in *Bulletin of Johns Hopkins Hospital*, 1916, showing effect upon the ovary of feeding pituitary extract (whole gland) for forty-two days as compared with a control rat.

As the results of the intravenous injection of urine were only partially satisfactory, blood serum was used next. Five c.c. of serum from a case of known pregnancy of four months' gestation were given intravenously and the rabbit autopsied in thirty-one hours. The ovaries were found to be enlarged and to contain numerous hemorrhagic follicles. The uterus also showed the results of great activity by marked swelling

and injection, probably due to the presence of the ovarian hormones in the serum.

Following this a series of 35 rabbits was injected intravenously with from 2 to 5 c.c. of serum and the earliest definitely positive reaction obtained was at thirteen hours. Numerous doubtful reactions were obtained with serum from known pregnancies when the rabbits died too soon or were autopsied too early. Of the series 7 rabbits died at various intervals, but only one was too early to show any reaction. One rabbit dying one and one-half hours after injection, showed marked congestion of the uterus and enlargement of both ovaries with developing hemorrhagic follicles seen microscopically. Of 24 rabbits injected with serum from known cases of pregnancy, 18 gave definitely positive results grossly. Another of these cases when autopsied at twenty-five hours, was doubtful grossly, but positive microscopically. Five other cases were doubtful or negative grossly when the rabbits died before thirteen hours had elapsed, but these were all positive microscopically. A doubtful reaction in the gross was obtained when serum was injected from a case which was one week postabortion, but microscopically this was positive. Five cases which were not pregnant gave negative results. A case of hydatidiform mole gave a very well marked positive reaction. The specimens giving positive reactions in the gross were obtained at from three weeks' to seven months' gestation. A positive test was obtained by the use of plasma instead of serum in one case of four months' gestation. Spinal fluid from a case of eight months' gestation gave a negative reaction. A case of questionable pregnancy of ten to twelve weeks with splenomegaly gave 3 negative reactions.

TABLE I

Positive reaction grossly with known pregnancy	18
Doubtful reaction grossly with known pregnancy at 25 hours, but positive microscopically	1
Death too soon (within thirteen hours) after injection to give definite reaction grossly, but positive microscopically	5
Death occurred at 30 minutes, no reaction grossly or microscopically	1
Negative reactions with known pregnancy	0
Negative reaction in a case of splenomegaly with question of pregnancy	3
Doubtful reaction grossly 7 days after abortion, microscopically positive	1
Case of hydatidiform mole	1
Negative reactions with no pregnancy	5
Total number of rabbits injected with serum	35

Of the 24 positive cases, 18 (75 per cent) gave a positive reaction grossly, and 6 (25 per cent) doubtful gross reactions were positive microscopically. There were no negative reactions with sera from cases of known pregnancy. The percentage of grossly positive reactions in-

creased considerably toward the end of the series as the technic was improved.

Several of the rabbits in this series were operated upon in order to examine the ovaries after injection of serum, and these were used again three weeks later, giving definitely positive results. The rabbits which died following the injection of serum intravenously were in the early part of the series when an attempt was being made to parallel the tests

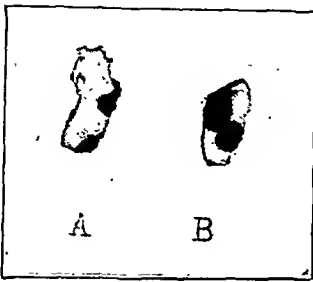


Fig. 2

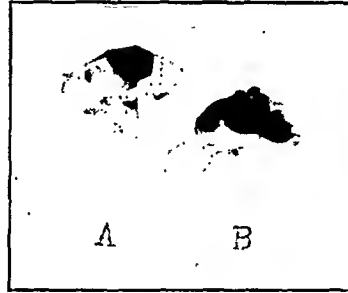


Fig. 3

Fig. 2.—Contrast of effects produced by equal amounts of (A) urine, and (B) serum (the latter about two times as marked) intravenously in rabbits.

Fig. 3.—Results from injection of (A) 2.4 c.c. and (B) 4.0 c.c. serum respectively (reaction in proportion to dose).

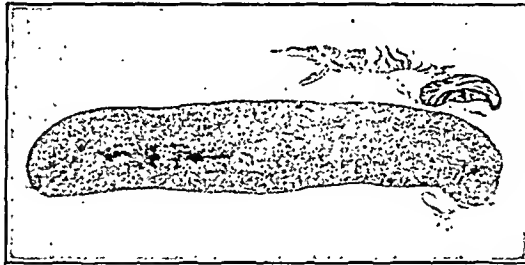


Fig. 4.—Low-power magnification of normal rabbit ovary.

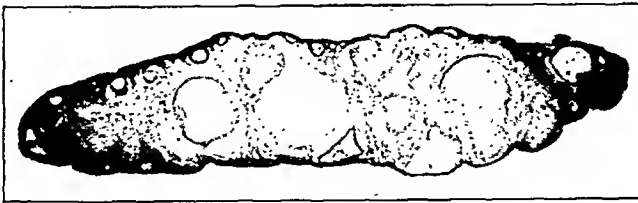


Fig. 5.—Lower-power magnification (same as in Fig. 4) of reacting rabbit ovary.

with those in which urine was given intravenously. The animals showed evidence of toxic reaction to the serum. The dose of 5 c.c. was too often fatal and was soon reduced. From this series the conclusion was drawn that approximately 1.0 c.c. of serum could be given for every 700 gm. body weight without being toxic and still produce the reaction.

When equal amounts of urine and serum were given to rabbits of the same weight and the tests allowed to run for the same interval of time, the contrast was very marked, the reaction from the serum apparently

about twice that from the urine (Fig. 2). A similar contrast was noted between the reactions to various amounts of serum, proportional to the dose (see Fig. 3). With a larger dose the "crop" of hemorrhagic follicles is increased. A considerable number of the follicles observed in this series showed the site of rupture even grossly. The time interval



Fig. 6.—Low power of hemorrhagic follicle ("Blutpunkt").

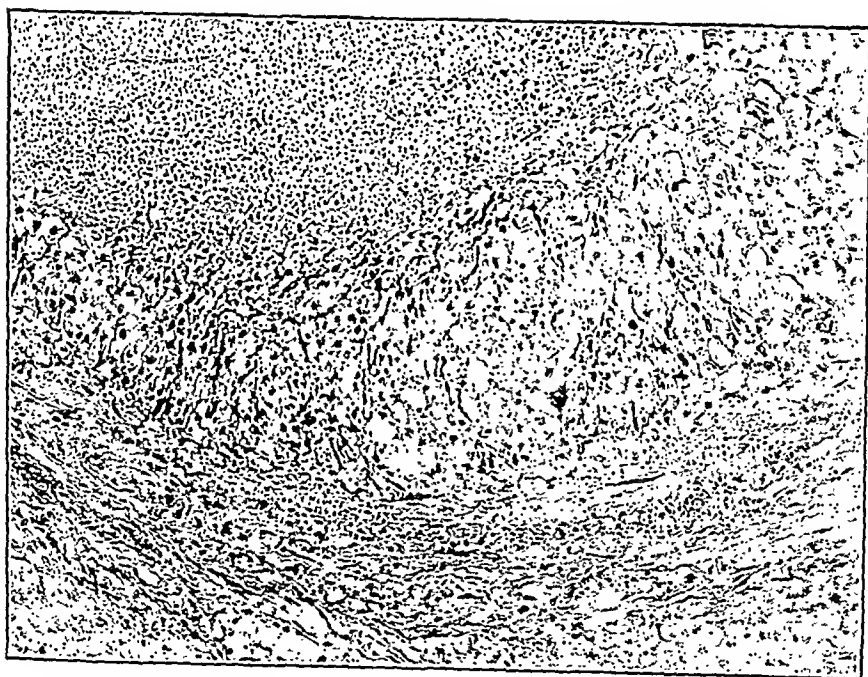


Fig. 7.—High power of area of beginning luteinization.

also seemed to play a part in the degree of reaction, which was noted in parallel tests when one autopsy was performed at twenty-four hours and the other at forty-eight hours.

Fig. 4 shows a low-power magnification of a normal rabbit ovary. Fig. 5 shows a similar magnification of a reacting ovary with the hemorrhagic follicles easily recognized. Fig. 6 shows a low power of a hemorrhagic follicle with luteinization commencing and this reaction is seen more clearly in the high power of this area in Fig. 7.

Whether the use of serum intravenously is of any more practical value as a "pregnancy test" than the other tests already devised, is not certain as yet. The important point to consider is that, by the intravenous injection of the serum of patients who are known to be pregnant, changes are produced in the ovaries and uterus of a rabbit which are entirely similar to the reaction observed in the Aschheim-Zondek "pregnancy test" but to a more marked degree.

SUMMARY

In the present modification of the Aschheim-Zondek test, 2 c.c. to 5 c.c. of serum were injected intravenously into the ear vein of a virgin female rabbit. Approximately 10 c.c. of whole blood are obtained from the patient and the serum is removed. The serum is allowed to stand for at least four hours or overnight before injection, as very fresh serum was found to be toxic and might cause death shortly after injection. The average effective amount of serum was found to be 1 c.c. per 600 to 700 gm. of body weight.

Rabbits weighing from 600 to 2,150 gm. were used. Animals weighing between 1,500 and 2,000 gm. gave the most constant results. A series of tests on the smaller rabbits proved to be very unreliable.

The rabbits were operated upon or autopsied from twenty-four to thirty-six hours after injection and the reaction could usually be determined by gross examination. Microscopic examination was used to check the gross findings. The rabbit could be used again at the end of three weeks.

The earliest grossly positive reaction was observed at thirteen hours. Several of the animals of this preliminary series died before thirteen hours had elapsed. The period of gestation varied from three weeks to seven months. Sera from 5 cases not pregnant were used and gave negative results. On a doubtful case of pregnancy, 3 tests were performed and were all negative. A case of hydatidiform mole gave a strongly positive reaction and was found to be negative three weeks later.

The reactions of the 25 positive specimens examined in this preliminary series were: 18 grossly positive; 5 doubtful grossly, but positive microscopically (rabbits died in less than thirteen hours); one

autopsied at twenty-five hours was doubtful grossly but positive microscopically; one died thirty minutes after injection and showed no reaction.

The reaction to the use of serum intravenously is found to be definitely more marked and to appear in a shorter time than when urine is used intravenously.

CONCLUSION

The blood serum of pregnant women when injected intravenously into female rabbits results in the development of hemorrhagic follicles and luteinization in the ovaries due to the presence of the anterior pituitary hormone.

This reaction may be observed more definitely in the gross than is the case in the original Aschheim-Zondek "pregnancy test" and in one-fourth to one-third of the usual time.

(As this preliminary report goes to press, we wish to report that 220 tests have been performed by this method and the results have proved correct in almost 100 per cent of the cases.)

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CHRONIC NEPHRITIS FOLLOWING APPARENT TOXEMIA OF PREGNANCY*

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A FOLLOW-UP study of the total cases of toxemia of pregnancy observed in the Obstetrical Department of the Johns Hopkins Hospital during the four-year period ending May 31, 1930, has recently been concluded by the author and M. L. Stout. It was the purpose of the study to reexamine as many as possible of these patients in an effort to ascertain how many of them eventually presented evidence of chronic renal involvement. Excluding toxemic vomiting and eclampsia, the return of two-thirds or 343 of the remaining patients was secured and definite signs of chronic nephritis were found in 137 (40 per cent) of them. In 1929, the author pointed out that 22 per cent of women suffering an attack of eclampsia will be found a year or more after delivery to have a definite nephritic process.

The correct diagnosis of nephritis had been made in the majority of these 137 women at the time of discharge from the hospital. A considerable number of them, however, had presented a rather mild process which apparently cleared up entirely during the early puerperium, so that the patients left the hospital with a normal blood pressure and with the urine free of albumin, and were considered at that time cases of low reserve kidney or preeclampsia. Likewise, a few of these patients were known to have had chronic renal disease prior to the onset of the pregnancy. Most of them already had hypertension, albuminuria, or symptoms indicative of toxemia when they first came under our observation for prenatal care. However, 29 of our nephritic women had registered in the Out-Patient department early in pregnancy and at that time had no hypertension, albuminuria, or symptoms. At the seventh month or thereafter, what appeared to be the clinical picture of low reserve kidney developed, or in a few instances, preeclampsia. In the majority of these patients the signs cleared up promptly in the early puerperium, yet at six weeks postpartum and thereafter, definite evidence of chronic nephritis was present. A brief analysis of these 29 cases together with 3 others which have been observed since, is the purpose of this paper, in which it is desired to stress the point that chronic renal damage has resulted from what clinically seemed to be a typical toxemia of pregnancy developing during or after the seventh month and in most cases apparently clearing up entirely in the early puerperium.

*Read by invitation at a meeting of the New York Obstetrical Society, May 19, 1931.

Table I presents data on the 32 patients in the series according to race, age, parity, and previous history. It will be noted that approximately two-thirds of the women were black, and a similar proportion multiparae. The average age was 28.84 years, a figure five years above that of the general clinic material. In 9 instances there was a previous history of toxemia of pregnancy, while one patient had had rheumatic fever and another repeated attacks of tonsillitis. In two-thirds of the cases no history of previous disease predisposing to renal damage could be obtained.

TABLE I. STATISTICAL DATA ON PATIENTS IN SERIES 32

<i>Race:</i>		<i>Age:</i>	
White	10	Average	28.84 years
Black	22	4 below age 20	
		8 above age 35	
<i>Parity:</i>		<i>Previous History:</i>	
Para 0	9	Toxemia	6
Para 1 and above	23	Eclampsia	3
Para 5 and above	10	Rheumatic Fever	1
Para 10 and above	5	Tonsillitis (repeated)	1

From a clinical point of view these patients prior to delivery presented the picture of a low reserve kidney or of a mild preeclampsia. Hypertension or albuminuria first appeared during the seventh month in 11 patients, and during the eighth month in 6, while in 15, or almost half of the total cases, the patient was apparently quite normal until at or near term. Table II indicates that the average high point

TABLE II. BLOOD PRESSURE AND ALBUMIN OBSERVATIONS

	PRIOR TO DELIVERY		DISCHARGE FROM HOSPITAL		6 WEEKS POSTPARTUM	4 OR MORE MONTHS POSTPARTUM
Blood Pressure	170.5		132.32		157.00	165.19
	116.88		89.19		104.25	105.13
Albuminuria	None	6	None	22	13	19
	Trace	8	Trace	8	2	3
	-1.9 gm.	13	+	1	3	9
	2.0 gm.-	5				

of blood pressure attained at the time of delivery was 170.5/116.88. In 5 instances the systolic pressure never reached 150 mm., while in only 4 was the high level of 200 mm. attained. Marked albuminuria (2 gm. or more per liter) occurred in only 5 patients, while in 7 casts were observed in the urine. It may be stated that the phenolsulphonephthalein and Mosenthal renal concentration test was done in 12 instances, but gave no information indicative of kidney damage. Thirteen patients had no edema at any time and only 3 presented marked water retention. In the majority of cases the eyegrounds were repeatedly examined but nothing to indicate nephritis was found.

diastolic readings, respectively, over that at the time of discharge. In 5 of the 18 cases albumin was present in the urine.

The patients in this series have all been under observation for at least four months and some of them for as long as four years since delivery. The average blood pressure at the present time, calculated on the basis of the latest dispensary reading, is 165.19/105.13, and 12 of them have some albuminuria. One patient died elsewhere two months postpartum, the clinical diagnosis being acute nephritis. Two patients have an essentially normal blood pressure but a marked and persistent albuminuria and have been diagnosed by the medical department as

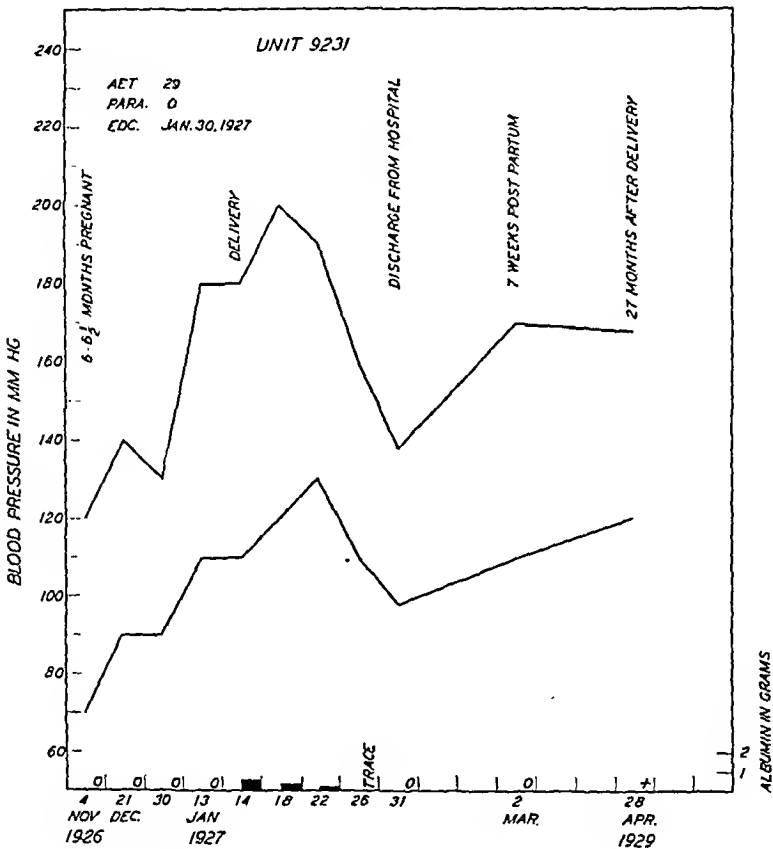


Fig. 2

having nephrosis. Persistent hypertension and albuminuria are present in 10 cases, while in the remaining 19 the diagnosis was made on marked hypertension alone, a subsequent pregnancy complicated by nephritic toxemia being a substantiating factor in 5 of these.

A brief résumé of 5 rather typical cases from the series follows:

CASE 1.—Unit 4138. (Fig. 1.) A nineteen-year-old black woman whose only previous pregnancy had been complicated by a mild toxemia which cleared up entirely in the puerperium. She again came under observation at the end of the fourth month of the second pregnancy, and at this time was quite normal, blood pressure 118/78, urine negative for albumin. The pressure rose gradually and two

weeks before term reached 160/110, albumin trace, slight edema of the ankles. Because of a contracted pelvis she was delivered by cesarean section. During the early puerperium the pressure fell, and she was discharged from the hospital on the seventeenth day after delivery with a pressure of 90/58, albumin trace. Six weeks postpartum the pressure had risen to 168/90 and twenty-one months after delivery the reading was 178/126, urine negative for albumin, severe headaches, afternoon edema, and beginning arteriosclerotic changes in the eyegrounds.

CASE 2.—Unit 9231. (Fig. 2.) A twenty-nine-year-old black woman, who first was observed during the sixth month of her first pregnancy, blood pressure 120/70, urine negative. There was a rapid rise of pressure late in the pregnancy, reaching 180/110 just before delivery, with albumin appearing in the urine to the extent of

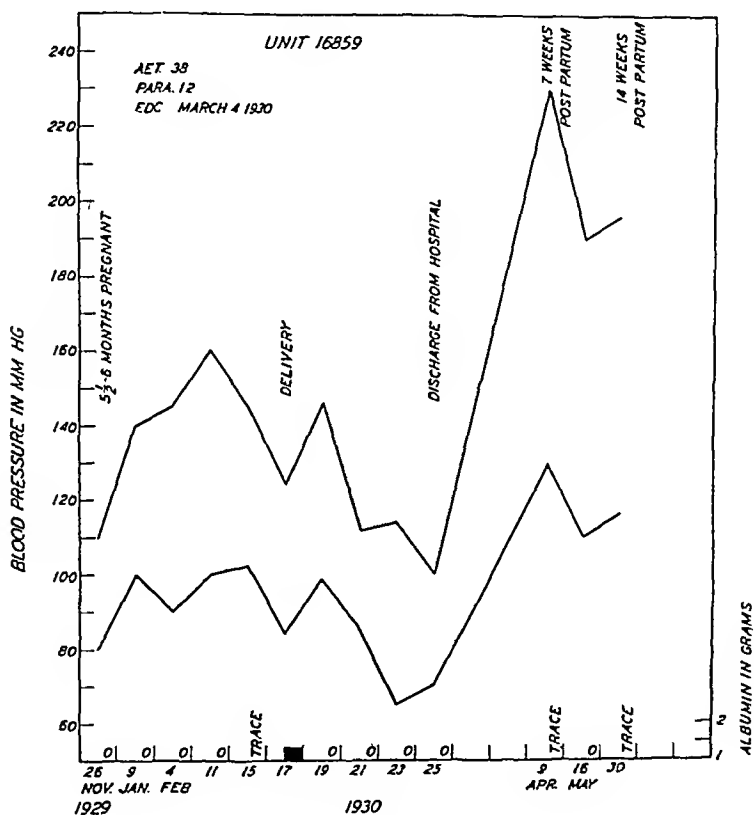


Fig. 3

0.4 gm. per liter and marked edema. Following a spontaneous delivery the pressure fell somewhat, but not to normal, and she was discharged on the eighteenth day of the puerperium, blood pressure 138/98, urine free of albumin. Six weeks postpartum, there was an increased hypertension and twenty-seven months after delivery the pressure was 168/120, with albumin constantly present in the urine.

CASE 3.—Unit 16,859. (Fig. 3.) A thirty-eight-year-old black multipara who first came under observation during the fifth month of her thirteenth pregnancy. Her obstetric career had hitherto apparently been uncomplicated. She developed a seemingly mild toxemia with the blood pressure reaching 160/102, a trace of albumin appearing in the urine, and slight edema. After a spontaneous delivery the pressure fell rapidly and she was discharged from the hospital on the eleventh day of the puerperium, blood pressure 100/70, urine negative. Six weeks postpartum the urine contained a trace of albumin and a marked hypertension was present, 230/130.

These findings persisted and she now has a pressure which is constantly around 200/120, albuminuria, headaches, and nycturia.

CASE 4.—Unit 17,582. (Fig. 4.) A twenty-year-old black woman who was first seen during the sixth month of her first pregnancy, blood pressure 122/80, urine negative. An attack of rheumatic fever was the only item of interest in the past history. Near term, hypertension and albuminuria developed and for this reason labor was induced and terminated by low forceps. The pressure fell rapidly during the puerperium and at discharge on the fourteenth day postpartum was 110/85, urine negative. Six weeks after delivery a hypertension of 145/105 had developed and the condition progressed so that fourteen and one-half months after the pregnancy albuminuria was present, and the blood pressure had reached 170/110.

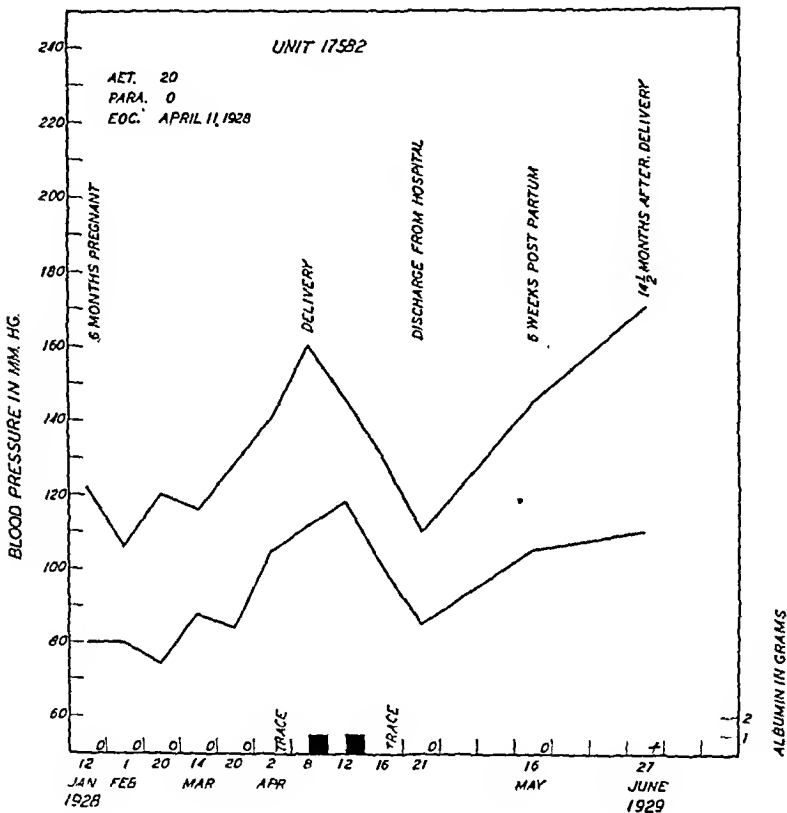


Fig. 4

CASE 5.—Unit 25,354. (Fig. 5.) A twenty-five-year-old black woman who came under observation at the sixth month of her first pregnancy, apparently normal in every way. Again a mild toxemic process developed and labor was induced at term. She was discharged from the hospital on the twelfth day of the puerperium with a pressure of 112/75, urine negative. Hypertension and albuminuria developed thereafter and ten months after delivery the pressure was 174/110, albumin trace, slight edema, headaches and nycturia.

DISCUSSION

We have previously shown that 22 per cent of eclamptic women will be found to have signs of chronic nephritis several months after delivery. Excluding this condition as well as vomiting of pregnancy,

it has been found that 40 per cent of the remaining toxemic patients likewise show signs of renal involvement during the puerperium or later. Many of these undoubtedly had a frank nephritis prior to the pregnancy. However, a certain number of them clinically seemed to be suffering from a preeclampsia or low reserve kidney and were so treated on discharge from the hospital, yet they returned later with apparently definite nephritis. In this paper we have collected a series of 32 patients who came under observation at varying stages of pregnancy prior to the seventh month and at that time were without

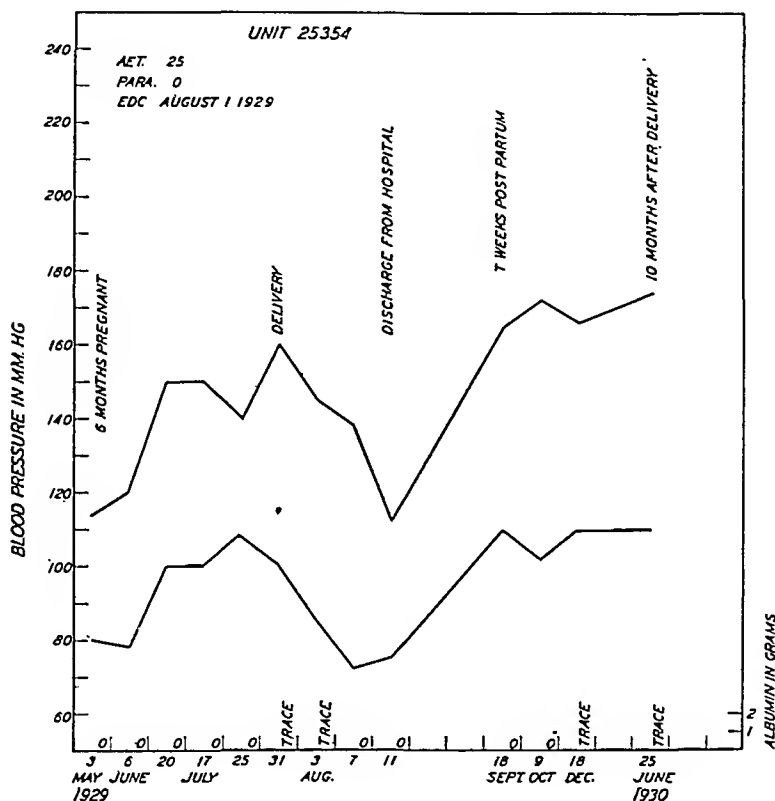


Fig. 5

symptoms, had a normal blood pressure and urine albumin-free. They developed signs of a clinically typical low reserve kidney or preeclampsia during or after the seventh month, which in most cases disappeared in the early puerperium. Six weeks postpartum or thereafter, these patients returned with evidences of chronic renal involvement which have persisted throughout their period of observation, varying from four months to four years.

We cannot say with certainty that at least some of these patients did not have a larval nephritis prior to the pregnancy in question. If, however, this process existed, it must have been extremely mild inasmuch as it produced no signs prior to the seventh month. Indeed, several of the women had been under our observation in previous preg-

nancies which were entirely normal. Consequently, it seems very probable that they owe their nephritis directly to the toxemic condition, which developed during the present pregnancy. In any event, one can say with certainty that any renal condition hitherto existing had become markedly aggravated by the pregnancy. In a number of instances the blood pressure six weeks postpartum was much higher than at any time prior to delivery.

We wish to point out that the custom of classifying a given toxemia by the blood pressure and urine findings during the course of pregnancy or even at the time of discharge from the hospital early in the puerperium is fallacious. Our observations show that many patients with an undoubted nephritis will have a normal pressure and negative urine after delivery and two weeks' rest in bed, while on the other hand, some women who leave the hospital after a toxemic attack with hypertension and albuminuria will later return entirely to normal.

Finally, it seems apparent that not only must we view every case of apparently mild toxemia with apprehension, since it may eventuate in an unexpected attack of eclampsia, but we must also be prepared to find at least an eighth of them several months later suffering from a definite chronic nephritis, which, however, is usually mild.

(For discussion, see page 441.)

EROSION, LEUCOPLAKIA AND THE COLPOSCOPE IN RELATION TO CARCINOMA OF THE CERVIX*

BY EMIL RIES, M.D., CHICAGO, ILL.

THE study of erosion and leucoplakia of the cervix has entered upon a new period since the introduction of the colposcope,† which is the invention of Professor H. Hinselmann of Hamburg. It is constructed so as to give an enlarged stereoscopic picture. The instrument for use in the office affords enlargement up to tenfold. A special construction for purposes of investigation supplies enlargement up to forty. The instrument is built for binocular use. It is mounted on a metal stand which permits of easy movement in every direction. Its manipulation is simple. (Fig. 1.)

The results of Hinselmann's work with the colposcope should have been published long ago as an introduction for the use of the profession. The difficulty which is causing the delay lies in the fact that the findings in the colposcope are practically impossible of rendition in black and white. Only reproductions in colors can give an adequate idea of what the colposcope reveals and the undertaking of a much needed atlas in colors has met with prohibitive financial difficulties. The only good reproductions of some of the pictures which Prof.

*Read before the Chicago Gynecological Society, April 17, 1931.

†Colposcopes are manufactured by E. Leitz, Wetzlar.

Hinselmann's artist has painted are found at present in Hinselmann's chapter on "Etiology of Carcinoma of the Uterus," in Stoeckel's *Handbuch der Gynaekologie*, Volume 6.

EROSION

Erosion much more than leucoplakia has been in the minds of gynecologists as a condition associated with carcinoma. Its descriptions for many years have been fairly uniform. The name is explained by

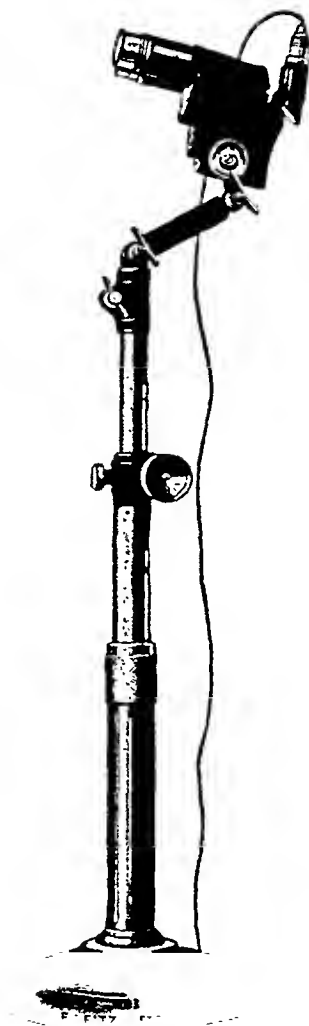


Fig. 1

the development of our knowledge of erosion. In the primitive period of gynecology, when the speculum furnished the closest means of study of the cervix, the early observers believed the red areas to be raw. The name of erosion expressed their concept of an area deprived of the normal surface layer. When Ruge, Veit, later R. Meyer studied the microscopic appearance of these areas it became evident that there was no loss of tissue, but a change from the normal stratified

epithelium to the columnar type. The name of erosion was therefore corrected into pseudoerosion, but the usage of decades has been to call the condition erosion with the tacit understanding that it is not a condition of tissue defect.

The embryologic study then revealed the fact that columnar and stratified epithelium are not definitely circumscribed to definite areas from the beginning throughout life, but that they are in a more or less constant change from one to the other and that this change can go on throughout life.

This process may lead to appearances of the portio which on inspection arouse the suspicion of carcinoma. Exploratory excision for microscopic investigation then is commonly used to decide the question. The decision often is easy, but there are many cases in which the irregularly arranged epithelium may necessitate considerable study and cause disagreement among investigators. As erosions are studied in the colposcope, their various appearances must be correlated with the microscopic findings on sections from exploratory excisions. If we compare constantly the colposcopic findings with the microscopic findings, we may learn to differentiate benign erosion and carcinoma with the colposcope without exploratory excision. Since there is a group of surgeons who object to the exploratory excision as a possible cause of metastatic growth, such an achievement would be most desirable.

In another way we have found the colposcope helpful, namely in guiding the treatment of erosions. The cautery treatment which at present may be called paramount, is handled most successfully under colposcope control. Not only is this true as to the extent of the erosion which is to undergo treatment, but especially in the early detection of areas in which repetition of the treatment is needed. In many cases which on macroscopic inspection appeared well skinned over, extremely minute red areas have been discovered by the colposcope in the midst of the newly formed stratified epithelium. On further watching these red spots now and then have developed into new areas of erosions. By timely discovery and treatment the course of the erosions which in our hands had not by any means progressed as steadily to complete healing as some reports would lead us to expect, is guided to the desired end.

When the erosion is healed completely, it presents the picture of the transformation zone as Hinselmann describes it, a picture with which the colposcope makes us familiar in a way which no ordinary examination with hand or speculum can supply. To reduce the area of erosion to the condition of the smooth transformation zone means to cure the erosion.

LEUCOPLAKIA

While erosion is a constant danger sign for cancer at its earliest stage, leucoplakia means nothing to most observers. Very few have

ever seen one and fewer still have had the opportunity to see it develop into carcinoma. It cannot be diagnosed by palpation and is easily overlooked in ordinary speculum examination. In fact, Hinselmann states that he had never seen a case himself before he used the colposcope, while in his report of June, 1929, he has accumulated 110 cases. In my own experience which is less than one year old, I have seen now two cases of leucoplakia, but had never before discovered one on examination of patients without the aid of the colposcope.

The scanty literature on leucoplakia is full of contradictions and the subject evidently is in need of considerable general attention before it can be settled definitely. It may be expected that the use of the colposcope is of prime importance in this movement, as it promises a greater number of cases discovered within a short time than the whole previous history of gynecology has supplied.

Leucoplakia is of sinister importance because of its connection with the growth of carcinoma. In six cases in the literature, development of carcinoma has been observed on the basis of leucoplakias followed for considerable periods of time. Whether this change into carcinoma is the universal and unavoidable outcome of every leucoplakia is unknown so far. Nor is the immediate future likely to present us with a great number of additional cases of such cancer development, as it is not to be expected that in our present state of knowledge many will be coldly scientific enough to watch a leucoplakia grow for years instead of promptly removing it to prevent further developments.

Leucoplakia appears in the colposcope as a white area, single or multiple, on the portio vaginalis or in the vagina or in the cervical canal, if the latter is open to inspection in consequence of laceration. The area is smooth. When an attempt is made to wipe it off, the underlying tissue looks different from the surrounding area. In a day or two the patch recurs.

To obtain the leucoplakic area of the portio for microscopic examination does not require amputation of the entire cervix. But it must be remembered that if a piece larger than the leucoplakia is removed, the lesion is impossible of recognition on the dead specimen, especially when it has been hardened in formalin. In order to obtain sections of the leucoplakia alone without cutting the whole specimen, it is necessary to have the exact location defined in memory or, as I have found helpful, by placing finest sutures through the superficial tissue at two opposite points beyond the leucoplakia, but inside the area to be excised.

Hinselmann has examined a considerable number of excised leucoplakic patches in a most thorough manner in serial sections and has given minute descriptions of his findings. The two most impressive features on microscopic examination which stand out even without serial sections, are to be found, one throughout the leucoplakia and the other one at its border.

The cells of the leucoplakia are packed densely, they take deeper stain in their protoplasm and in their nuclei, they are more irregularly arranged than in the normal stratified epithelium. Their basal layer is different from the normal basal layer in shape and staining quality. Protoplasmic bridges between the cells of the malpighian layer are less frequent and less pronounced. At the border of the leucoplakia there is a complete change which surprises the observer by its abruptness in a sharp, usually perfectly vertical line extending from the base to the surface. In the leucoplakia the very last basal cell toward the normal tissue produces a totally different generation of cells from those starting out from the first and all other basal layer cells of the normal epithelium.

From the leucoplakia masses of abnormal epithelium protrude into the connective tissue underneath to a varying depth. The surface always remains flat. But the growth downward can extend so far and become so irregular in its outline that a first glance invites the diagnosis of carcinoma. Considerable discussion has arisen about this feature. What one author calls simply atypical growth, another unhesitatingly qualifies as carcinoma. Hinselmann has gone to the trouble of rebuilding serial sections by the modeling method into three-dimensional representations of his most advanced cases of leucoplakia and these models leave little doubt as to their desperate similarity to small carcinomas.

Hinselmann argues that all leucoplakias observed for sufficient time have developed carcinoma (the 6 cases mentioned above). His own advanced cases are practically impossible of differentiation from carcinoma. It appears from the literature that leucoplakia may take years to develop carcinoma. Therefore every leucoplakia must be considered a step in the development of the carcinomatous process.

Hinselmann has observed numerous cases of syphilitic leucoplakia on the portio and their differentiation from the nonsyphilitic is a matter requiring further study. If the clinical and laboratory investigation of the patient with a doubtful leucoplakia indicates syphilitic infection, the therapeutic test may be employed. Hinselmann, however, reports a case of leucoplakia in a syphilitic woman recurring after careful antisyphilitic treatment.

CARCINOMATOUS SURFACE COATING

Pronai, Schauenstein, Kermauner, Schottlaender, von Franqué, Lahm and others have described a condition which they call "carcinomatous surface coating" (Belag, in German). It occurs in two forms, probably different stages of the same process. In one the typical carcinomatous tumor with invasion of the deep layers is more or less surrounded by an area in which the surface epithelium is replaced by a layer of cells which are exactly like the cells of the carcinoma, but do not invade the underlying tissue. These cells end abruptly and without transition toward the normal epithelium. They form therefore a coating in the same way as the frosting on the so-called frosted liver, though of a different composition. In other cases this frosting or coating is the only carcinomatous change in the uterus, but may extend over the entire cavity. Its carcinomatous nature might be considered doubtful, were it not for the fact that more or less lymphatic involvement may accentuate the malignant nature of the process. If any part of such a surface coating produces considerable invasion of the deeper layers of the organ, the condition first mentioned

of a typical tumor surrounded by a zone of coating, would be the result.

These surface coatings appear entirely different from the surrounding mucosa if observed in the colposcope. They have been discovered without the colposcope on microscopic examination only. But the colposcope will enable us to diagnose them in the living, if they come within the range of the eye reinforced by the instrument.

ADDITIONAL USES OF THE COLPOSCOPE

Gynecologists generally regret the fact that carcinomas do not reach them as early as they should. By the time the classic symptoms of irregular discharge and hemorrhage lead the patient to the physician and the case is diagnosed from the findings of tumor or ulceration or both as malignant, the process frequently is found to be quite advanced. Carcinomas have been described as early cases, the dimensions of which can be expressed in several centimeters, the smallest one known being 1 by 0.75.

With a ten power enlargement such as the colposcope affords, it is certain that smaller carcinomas can be found. A tumor only one millimeter in its greatest dimension of surface would appear of one centimeter size. While it might be overlooked in an ordinary speculum examination, it cannot fail to strike the eye of the examiner as something abnormal inviting further investigation. The principal advantage of the instrument is that changes in the surface are so minute that they cannot be felt and can easily be overlooked in the ordinary speculum examination, but become plainly visible in the colposcope.

There exists a gap in our knowledge of carcinoma of the portio between the smallest carcinoma detected by the microscope alone and the distinct tumor which is commonly seen. Naked-eye observations of the stages between these two are lacking. From the work of Kermauner and Schottlaender it is evident that at the present time carcinomas are constantly overlooked. They examined microscopically the cervix in 400 uteri which had been removed for causes other than carcinoma, such as fibroid, metropathy, etc. In these they found carcinoma in 2 per cent of the portios which in the preoperative diagnosis had escaped detection. No colposcopic examination of these cases before operation is reported. Routine examination of all cases preparing for hysterectomy should link up the colposcopic findings with the microscopically small carcinoma which at present is overlooked.

There is a period of growth of carcinoma between this stage shown by Kermauner and Schottlaender and the stage which is represented by the smallest visible or palpable tumor. This intermediate stage is unknown in its macroscopic appearance and possibly only represented by certain observations of carcinomas removed in exploratory excisions. These observations concern cases in which the carcinoma was

so small that the exploratory excision comprised all of it and no further carcinoma could be found in the organ removed completely. Frankl has discussed these very early cases as to their microscopic pictures, but there are no descriptions in the literature of their macroscopic or colposcopic appearance. Here again future work with the colposcope should widen diagnostic possibilities.

GENERAL USE OF THE COLPOSCOPE

In order to lessen the deplorable carcinoma mortality various propositions have been made in the direction of preventive surgery, such as suture of all lacerations of the cervix, amputation of the cervix, or even vaginal hysterectomy on every woman of carcinoma age. All of these so-called protective methods fail to reach the bulk of carcinoma candidates, because they involve an operation. They furthermore appear largely unnecessary, because they would remove many organs which never would have developed carcinoma.

But it would be entirely rational to invite all women to regular colposcopic examinations. As these are simple and painless and require little time, they ought to be consented to readily and repeatedly. The colposcope would then lead to the discovery of carcinomas at such early stages that extensive operations would not be needed. The fight against uterine cancer of which carcinoma of the portio represents a large proportion could thus be waged with increased chances of success.

The fundamental difficulty to be overcome has always been the indifference of the patients. It is necessary to acquaint them again and again with the risks of tumor development, but it is also necessary to inform them of simple improvements in the means of diagnosis in order to break down their fears of painful procedures and interest them in ways and means of protecting themselves. A colposcopic examination must come to be part of every periodic health examination, of every examination for life insurance and should be as familiar and routine as an uranalysis and a blood examination.

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(For discussion, see page 451.)

POSTERIOR OCCIPUT PRESENTATION*

ANALYTICAL REVIEW OF POSTERIOR OCCIPUT PRESENTATIONS OCCURRING IN 1,000 CONSECUTIVE DELIVERIES AT THE EVANSTON HOSPITAL

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(From the Department of Obstetrics and Gynecology of the Evanston Hospital)

IT HAS been customary from time to time in the obstetric department of the Evanston Hospital to review the histories covering certain types of delivery. Such analytical reviews have been instructive and beneficial, for in retrospect our method of treatment is often an improvement over the actual methods used.

The number of occipitoposterior presentations occurring in the 1,000 consecutive cases in the period from November, 1928 to January, 1930 inclusive was 144, an incidence of 14.04 per cent. These we have placed in three groups:

- Group 1. Posterior occiputpresentation, delivered in the posterior position.
- Group 2. Posterior occiputpresentation, rotating spontaneously to anterior position.
- Group 3. Posterior occiputpresentation, rotated manually to an anterior position.

Group 1.—Fifty (50) or 34.7 per cent of the total number of cases were delivered in the posterior position. As might be expected there were only 10 primiparae, the remaining 40 being multiparae. All patients were at term. The duration of labor varied from one hour and fifty-two minutes to thirty-three hours and fifty minutes; the average length of labor being seven hours and thirty-seven minutes. The length of the first stage varied from one hour and forty minutes to thirty-three hours and forty minutes, with an average length of seven hours and twenty-four minutes. The second stage had a variation of ten minutes to four hours and fifteen minutes with an average duration of forty-one minutes. Thirty-six delivered spontaneously, 11 with low forceps and 3 with mid forceps. Only a small percentage of this group received any sedative during the first stage. There was no maternal or fetal mortality.

Group 2.—Posterior occiput presentations rotating spontaneously to an anterior position, numbered 43, or 29.9 per cent of the total number of cases. All of these patients were at term. There were 20 primiparae, about double the number in group one, and 23 multiparae.

*Read before the Central Association of Obstetricians and Gynecologists, Excelsior Springs, October 10, 1930.

The hours of labor varied from two hours and forty-eight minutes to twenty-seven hours and thirty-three minutes, an average duration of eleven hours and thirty-six minutes.

The first stage varied from two hours and ten minutes to twenty-seven hours and twenty-five minutes, an average first stage of ten hours and fifty minutes, an increased average of about three hours over that of group one. The second stage varied from ten minutes to three hours and three minutes, giving an average second stage of fifty-two minutes as compared with forty-one minutes in group one. In this group an estimate was made of the time the head remained in the posterior position, before the spontaneous anterior rotation. The time varied from two hours and ten minutes to twenty-seven hours and fifty minutes; with an average time of eleven hours and twenty-four minutes. This is a reasonably accurate estimate because the interns are instructed to see the patient every half hour or oftener if necessary and rectal examinations are made if there is an increased frequency or any change in the character of the pains. Although to some it may appear too long a period to allow the head to remain in a posterior position, the resulting absence of either maternal or fetal mortality in this group rewarded our conservatism. Thirty-two delivered spontaneously. Ten with low forceps and one with mid forceps.

Group 3.—Posterior presentations which were rotated manually to an anterior position (one exception being a Scanzonian maneuver) numbered 51, or 35.4 per cent of the total number of cases, 37 primiparae and 14 multiparae. In this group we thought it unnecessary to note the length of time in the first and second stage of labor because the time the head was allowed to remain in the posterior occiput position before interference is the important point to consider. The elapsed time in each instance was just a few minutes less than the total hours of labor. The shortest time elapsed was fifty minutes and the longest thirty-seven and one-half hours, or an average time of twelve hours and twenty-eight minutes. Full dilatation was completed normally in all but 3 instances. In one of these three Duehrssen incisions were made, and in two, complete dilatation was produced manually.

Period of complete dilatation before attempted delivery was also noted. In 23 instances, delivery was made immediately after complete dilatation. In 28 cases, the time ranged from fifteen minutes to three hours and five minutes, an average time of forty-seven minutes before any interference was instituted.

The indications for immediate delivery or delay, were:

In the case of the mother

1. Amount of exhaustion
2. Type and frequency of labor pains and degree of effacement and dilatation

In the case of the baby

1. Rate and strength of fetal heart
2. Degree and rapidity of descent of head
3. Ratio between head and pelvis

In all instances except one, a Seanzoni operation, the head was rotated to an anterior position manually. In every instance forceps were applied and delivery attempted. Thirty-five in this group were forceps deliveries; 26 low forceps, 8 mid forceps and 1 high forceps, the remaining 16 were delivered by version and extraction. No mothers were lost, but three babies died as a result of the version and extraction manipulation. One lived a few minutes and the other two were stillborn. The fetal heart was audible until the delivery started. The postmortem examination on these babies revealed brain hemorrhage, traumatic in origin.

In 13 cases cervical lacerations were found, and in 1 case Duehrssen incisions had been made. The remaining 37 had no cervical tears.

DISCUSSION

The discussion of these cases must necessarily be the author's personal opinion and he therefore craves your kind indulgence.

Group 1 in which the patients delivered in the posterior position show a surprisingly short average labor of seven hours and thirty-three minutes. It being the general impression that such a type of delivery is accomplished only after long hours of labor, this low average, in part is due, I am sure to our routine use of nitrous oxide and ethylene gas for analgesia in the second stage of labor. A specific instance showing the importance of hospitalization in obstetric cases.

Group 2 in which anterior rotation was spontaneous, numbered 43, or 29.9 per cent of the total number of cases. This is a very satisfactory percentage for it is this type of case that demands sound obstetric judgment, and requires experience and training for its proper management.

In group 3, where interference is indicated there are in most cases definite symptoms relating to mother or fetus that aid one's judgment. The important consideration is, with what type of interference to proceed in a given case. The infant mortality rate of 5.88 per cent (3 out of 51 cases) is a little high, showing either an error in judgment, or lack of skill in the delivery.

A. *Concerning a possible error in judgment in this procedure.*—Perhaps the labor was allowed to proceed to the detriment of the fetal heart strength, or a disproportion between fetal head and pelvic outlet escaped notice.

B. *Concerning lack of skill at this point.*—Perhaps the head was not rotated to the anterior position, or there was a possible faulty application of forceps, or there was too much traction with the forceps, or in the case of version and extraction, a brain injury to the child was

inflicted because the operator was in too much of a hurry in delivering the after-coming head.

The author has occasionally, in the case of a small fetus delivered a persistent occipitoposterior by version and extraction without any attempt at manual rotation. When the head is small and the bone plates in the baby's skull are widely separated, I think it a little safer procedure than the use of forceps. If we all had the skill of a Potter *some* of our version and extractions might be more successful. Although many obstetricians apply forceps to the after-coming head as a routine measure, the staff at the Evanston Hospital delivers more cases without than with the aid of forceps. We have had good results with the Piper forceps.

Cesarean section is correctly indicated in persistent posterior occiput presentation when the trial of labor has been sufficient and dilatation has not progressed to the point where its completion can be executed. This is particularly the case in the so-called borderline type of contracted pelves.

The author would like to state that he found Keielland's forceps, because of their shape and length, very satisfactory if applied in like manner to other forceps to the anteriorly rotated head. We have not had much success with these forceps when using them in the manner prescribed by their inventor.

PROLAPSED UMBILICAL CORD*

AN ANALYSIS OF ONE HUNDRED CASES

BY JULIUS KURZROCK, M.D., NEW YORK, N. Y.

(From the Obstetrical Service of the Harlem Hospital)

WE MAY consider prolapsed cord a condition in which that structure has left its normal site and has taken a position compromising the life of the fetus. According to its position we may classify this entity as follows: (1) occult or concealed, (2) presenting, and (3) prolapsed.

The statistics of prolapsed cord herewith presented are based on the records of 100 consecutive cases treated at Harlem Hospital in New York during the years 1915 to 1927 on the services of George L. Brodhead and Fred A. Kasseholm, and represent the combined work of ten members of the visiting staff and a number of interns.

Frequency of Prolapsed Cord.—In 16,942 consecutive deliveries there occurred 100 cases of prolapsed cord giving a frequency of one in 169 deliveries. This figure tallies with the ratios reported in several of the recent series, as noted in Table I. The average frequency is about

*Read before the Section of Obstetrics and Gynecology, New York Academy of Medicine, New York City, November, 1930.

1:137. DeLee reports a frequency of 1:400. On the other hand, Dietrich and Schweitzer report a ratio of 1:85:88. This increased frequency is reported by these authors as due to the prevalence of rickets in their community.

TABLE I. INCIDENCE OF PROLAPSED CORD

AUTHOR		NO. DELIVERIES	NO. PROLAPSE	
Stowe	1907	7,900	48	1:164
Dietrich	1908	26,743	312	1:85
Knapp	1912	68,000	624	1:189
Makouski	1912	13,059	85	1:165
E. Zweifel	1912	10,000	66	1:151
Roth	1919	25,333	165	1:153
Halter	1920	90,468	894	1:101
Schweitzer	1922	18,934	214	1:88

Position and Presentation.—Abnormal position and abnormal presentation at birth have been frequently referred to as a primary cause of prolapsed cord. However, in the present series, 59 cases of prolapsed cord occurred in vertex presentation, 23 in breech, and 18 in transverse presentation. The incidence of occurrence predominates in transverse cases. As indicated in Table II, prolapsed cord occurs about once in every 200 cases of vertex presentation, about 6 times in 100 breech cases, and about 10 times in every 100 transverse presentations.

TABLE II. INCIDENCE OF PROLAPSED CORD AS TO PRESENTATION

COMPILER	PRESENTATION		
	VERTEX PER CENT	BREECH PER CENT	TRANSVERSE PER CENT
Cunz	1.01	5.51	12.2
Scanzoni	0.35	4.37	7.28
Hecker	0.68	9.09	5.81
Gusserrow	0.76	5.81	14.29
Zweifel	0.41	5+	10.3

Period of Gestation.—In the present series there were 71 cases of prolapsed cord at full term, 17 at eight, and 12 at seven months of gestation. From the point of view of parity, prolapsed cord occurred in 26 primiparae and 74 multiparae. Prolapsed cord is about three times more frequent in multiparae than in primiparae, and the incidence of prolapsed cord increases with the added parity.

Previous Labors.—Of the 74 multiparae, 64 gave histories of previous normal labors. In the remaining 10 cases, 2 patients had cesarean sections for contracted pelvis, 6 were delivered by forceps, and one had a breech presentation. The previous labor of one patient was unknown. Stowe reported 12 cases with previous obstetric complications in his series of 51 cases, two of whom had a previous prolapsed cord. He also reported a case which had a total of three deliveries, all complicated by prolapsed cord.

Degree of Cervical Dilatation.—In 75 patients the cervix was fully or almost fully dilated when they were first seen. In the remaining 25 patients the dilatation was from 1 to 4 fingers.

The Relationship Between Prolapsed Cord and Membranes.—In this series, 70 of the patients were admitted to the hospital with membranes ruptured and the cord prolapsed. The remaining 30 patients were admitted with unruptured membranes. The cord was felt presenting through the membranes in 5 instances. In the remaining 25 cases the cord was not felt, but when the membranes ruptured, the cord prolapsed.

Fetal Heart and Cord Pulsation.—We noted that there were 11 patients with normal fetal heart sounds but not cord pulsation, 7 of whom gave birth to a living baby. There were 2 patients in whom no fetal heart could be heard despite pulsating cord, and in one instance a living child was born. Further there were 2 with absent fetal heart sounds and cord pulsations, and both were delivered of a living child.

Deformities of the Pelvis and Other Complications.—Deformed pelvis is reported to be the most common cause of prolapsed cord. Hildebrandt, Von Winckel, Engelman, Gusserow and others reported from 33 to 45 per cent of cases with prolapsed cord in contracted pelvis, whereas in our series 17 patients were found to have contracted pelvis, about 17.5 per cent of the total number of cases. There was an added complication of placenta previa in 5 instances. In 5 other cases an accidental hemorrhage had occurred, and there was one case of hydramnios. Placenta previa per se predisposes to prolapsed cord in two ways: first, the placenta by its low implantation displaces the cord downward; and second, the presence of the placenta in the lower uterine segment may interfere with the engagement of the presenting part.

Bagging and the Occurrence of Prolapsed Cord.—The introduction of a bag to induce labor or hasten cervical dilatation is frequently a factor in the production of prolapsed cord. The larger the bag inserted, the greater the displacement of the presenting part. Schweitzer reported 214 cases of prolapsed cord, 17 of which followed the insertion of a bag. In our series, 7 cases of prolapsed cord followed the introduction of a bag.

Thus it will be seen that the fetal mortality is relatively greater in transverse presentation and relatively lower in footling presentations.

TABLE III. GROSS FETAL MORTALITY = 63 PER CENT

PRESENTATION	NO. OF CASES	NO. OF STILLBIRTHS	PER CENT OF FETAL MORTALITY
Transverse	18	13	72.2
Vertex	59	40	67.7
Breech	11	6	54.5
Footling	12	4	33.3

It is strange, however, that the fetal mortality in transverse presentations, where the pressure on the cord is commonly assumed to be slight, is higher than in vertex presentations where cord compression is increased.

There were 34 fetal deaths before admission. Therefore, in order to estimate the value of the treatment administered, only those patients who were admitted with a living fetus must be considered. There were 66 such patients, 37 of whom were delivered of living babies, and 29 of stillbirths, giving a fetal mortality of 43.9 per cent. (See Tables IV and V.)

TABLE IV. FETAL MORTALITY PRIOR TO ADMISSION

PRESENTATION	NO. OF CASES	NO. OF FETAL DEATHS BEFORE ADMISSION	PER CENT OF FETAL MORTALITY
Transverse	18	11	61.1
Footling	12	4	33.3
Breech	11	3	27.2
Vertex	59	16	27.1

TABLE V. FETAL MORTALITY AFTER ADMISSION = 43.9 PER CENT

PRESENTATION	NO. OF CASES	NO. OF STILLBIRTHS	PER CENT OF FETAL MORTALITY
Vertex	43	24	55.5
Breech	8	3	37.4
Transverse	7	2	28.5
Footling	8	0	0

There are, of course, added factors which increase the fetal mortality, namely, contracted pelvis, accidental hemorrhage, placenta previa and prematurity. It is of interest to note that in 8 cases with contracted pelvis, vertex presentations and prolapsed cord, there were 7 stillbirths; and in 3 instances with contracted pelvis and breech presentations, there were no stillbirths.

Cervical Dilatation and Fetal Mortality.—Of 14 patients in whom the cervix was dilated 4 fingers or less when first seen, there were 8 stillbirths, giving a fetal mortality of 57.1 per cent. There were 52 patients who were from 4 fingers to full dilatation when first seen, and of these, there were 21 stillbirths, giving a fetal mortality of 40.3 per cent.

A further analysis of our fetal mortality shows that in 18 transverse presentations, 11 babies died prior to hospitalization. Of the 7 cases admitted, only 2 were lost. Likewise in footling presentations, of which there were 12, 4 babies died prior to admission. In the remaining 8 cases none were lost. It is interesting to note that while transverse and footling cases present a high fetal mortality prior to hospitalization, the results of therapy were gratifying. In vertex presentation the results were less successful since in 43 cases admitted with living fetuses, 24 babies were lost.

Maternal Mortality.—There were no maternal deaths in this series which could be ascribed directly to the prolapsed cord and the treatment thereof. Two mothers, however, died, one as a result of a premature separation of the placenta and the other from sepsis, death occurring two weeks after delivery. This patient was admitted with a history of previous interference.

In conclusion we may state that despite the various therapeutic measures available, prolapsed cord still remains a serious complication with a very discouraging fetal mortality.

545 WEST END AVENUE.

OBSERVATIONS ON THE USE OF SPINAL ANESTHESIA IN ABDOMINAL OBSTETRIC OPERATIONS*

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PREGNANCY, whether or not we view it as a physiologic state, is all too often a complicating factor in preexisting organic disease of the individual. Quite as important and serious are the metabolic and organic disturbances, which occur with, and are directly attributable to, human gestation.

It all too frequently happens, when certain of these conditions apply, that the life or health of the mother is endangered. This situation presumes a risk to the viable child equally as great as that of the mother. If operative termination of the pregnancy is indicated, the necessity for obviating all possible damage due to the anesthetic must be considered.

The safety of the patient is always a paramount consideration. Therefore, the employment of any anesthetic agent which increases the risk to the patient can be justified only by definite compensating advantages which accrue through its use.

In certain of the complications of pregnancy, spinal anesthesia may be employed to good advantage. It is the purpose of the present discussion to attempt an evaluation of its advantages and disadvantages under the conditions mentioned above.

The early use of this method of anesthesia in obstetrics is credited to Kreis¹ (1900). Shortly thereafter it was used for the same purpose by Doleris, Marx, Dupaigne, and others.²

Cocaine, which was used at this time, was so toxic that the procedure was early brought into disrepute. The less toxic drugs, stovaine and novocaine, have since

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been developed, and are now generally employed. The latter preparation is used almost exclusively in this country. More recently Brindeau³ and Delmas⁴ in France, and Krause⁵ in Germany, have used lumbar anesthesia in obstetrics over a considerable period with satisfactory results.

Certain developments in the technic of spinal anesthesia have caused a revival of interest in it during the past few years. The use of ephedrine, improved lumbar puncture technic and the development of anesthetic solutions of low diffusibility have been the chief advances.

The introduction of the use of ephedrine with lumbar anesthesia is credited to Ockerblad and Dillon⁶ (1927) and represents a real advance. This drug is a powerful peripheral vasoconstricting agent, which acts on the sympathetic system and counteracts or diminishes the vascular depression which formerly in spinal anesthesia was much feared. The duration of its action is sufficient for the average operation and as Sise⁷ has pointed out, it is more effective in preventing blood pressure fall than in raising it, once the drop has occurred.

Improvement in lumbar puncture technic has consisted largely in the use of smaller needles with points designed to produce minimal trauma to the dura. The severe postanesthetic headache is no longer a common complication.

There has also been a revival in the use of novocaine solutions of specific gravities either higher or lower than that of the spinal fluid. Pitkin⁸ has added to these a stable starch which prevents rapid diffusion of the novocaine with the spinal fluid until fixation of the drug by nerve tissue has occurred.

This solution, known as "Spinocaine," is of lower specific gravity than the spinal fluid and is well suited to anesthesia involving the upper and lower abdomen. Because of the differential specific gravities of the solution and the spinal fluid, the patient must be kept in some degree of Trendelenburg position until the novocaine mixture has become fixed. Since the majority of abdominal obstetric operations preferably are done with the patient in this position, spinocaine presents no objectionable features on this account.

The use of novocaine (procaine) crystals dissolved in spinal fluid and injected into the subarachnoid space still constitutes, according to Labat,⁹ one of the most simple, safe and sound methods of inducing lumbar anesthesia. When novocaine solution is injected into the subarachnoid space a combination occurs between the solution and the anterior and posterior roots in contact with the drug, resulting in interruption of the nerve conductivity.

The sympathetic nervous system controls vasoconstriction and has intimate connections with the spinal roots by way of the rami communicantes. Therefore, the higher the spinal roots are involved, the higher the level of paralysis of the sympathetic chain. Any large involvement of this system will cause dilatation of the splanchnic blood vessels with resulting diminution of blood pressure. Fortunately, in abdominal obstetric operations, a level of anesthesia slightly above the umbilicus is adequate. It is unusual to have nausea, vomiting, or extreme blood pressure fall with anesthesia at this level.

On the basis of numerous spinal anesthetics in pregnant women, and of experiments on pregnant rabbits, Ducuring¹⁰ concluded that the human pregnant uterus behaves under spinal anesthesia as does the pregnant uterus in rabbits after complete section of the lumbar part of the spinal cord. It has been frequently observed in cesarean sections under spinal anesthesia, that immediately after the extraction of the child the uterine body contracts firmly and remains contracted, while the lower uterine segment and vagina are relaxed.^{3, 11} The author has yet to see a case of postoperative atony of the uterus following subarachnoid block. From this standpoint, it is ideal for the performance of cesarean section, especially of the low cervical type.

The diminished hemorrhage noted during operation under this anesthesia is due to lowered blood pressure and implies that hemostasis must be carefully effected in order to prevent postoperative oozing and hematoma formation.

The excellent relaxation of the abdominal walls, the contracted intestines, and the facility with which operative procedures may be accomplished, have been sufficiently extolled in recent surgical literature.

No one who has had experience with this method can fail to be impressed by the diminished postoperative discomfort experienced by these patients. They are able to take food early and marked distention is seldom seen. These observations bear out the statement of Babcock¹² that "when properly employed, no other anesthetic of equal range leaves so few sequelae."

The greatest disadvantage of spinal anesthesia is inherent in the method, i.e., that the total dose of the drug is injected at one time, and any untoward reaction of the patient cannot be treated by its removal. Failure of induction occurs in 5 to 6 per cent of cases according to De Takats.¹³ It is due in the majority of cases either to extradural injection, or leakage of the drug. The disadvantages of the relatively short duration of anesthesia do not obtain in abdominal obstetric operations because these procedures may be accomplished within the time limit of anesthesia with a minimal or average dose.

The one complication of spinal anesthesia most feared, is that of vascular depression followed by respiratory failure. The histories of fatal cases show that the most serious type of respiratory collapse is that occurring in the first few minutes following anesthesia. It is the most difficult with which to deal and according to Labat,¹⁴ is due to heavy dosage or poor induction technic.

Respiratory failure may occur any time during the operation especially the first thirty minutes. Its occurrence is preceded by fall in blood pressure, and the symptoms associated are change in respiratory rhythm, pallor or cyanosis and mental torpor. Sise⁷ has called attention to the extreme susceptibility of these patients to anoxemia. If these changes are recognized, early treatment is most effective and satisfactory.

This means that with spinal anesthesia, the anesthetist must not only know the physiologic actions of the drug and the correct technic for its use, but he must anticipate and recognize all untoward reactions of the patient and be in a position to begin immediate treatment. For the details of treatment of respiratory failure and the minor complications of spinal anesthesia, the excellent reports of Sise,⁷ Labat⁹ and Babcock¹² should be consulted.

It has been suggested that the presence of pregnancy may increase the risk for the patient in abdominal operations under spinal anesthesia. Despite various explanations, which have been advanced for this possibility, the explanation of Babcock¹⁵ seems a most rational one. He says, "It is my impression, that owing to the limited action of the diaphragm from the abdominal distention, the danger of spinal anesthesia is somewhat greater in the latter months of pregnancy." To counteract such increased risk, means that the dosage of the drug must be kept at a minimum; the level of anesthesia must be kept low; and the respirations closely observed.

If the mortality statistics tell us anything, it is that indiscriminate use of spinal anesthesia is a dangerous procedure but that used discreetly it is a method of great value. Tendler¹⁶ has collected from the literature 326,910 spinal inductions with 80 deaths. This means a ratio of one death in 4,086 cases. Babcock,¹⁵ who has performed over 20,000 spinal inductions, considers that this anesthetic has a mortality of about one to 500 when used indiscriminately and without skilled care, and less than one to 10,000 when used under the best conditions. Sise⁷ has shown what has resulted from the general enthusiastic adoption of this method in

our own community. He concluded that the ratio of mortality under these circumstances was approximately one per 100 cases.

In Table I are listed recent series of cesarean sections under spinal anesthesia, with deaths attributed to this method.

TABLE I

AUTHOR	DRUG	CESAREAN SECTIONS	DEATHS DUE TO ANESTHETIC
Brindeau ³ (1926)	Stovaine	102	2*
Brindeau ¹⁷ (1928)	Novocaine	60	0
	Stovaine		
Friedman ¹⁸ (1926)	Novocaine	100	0
	Tropacocaine		
Astley ¹⁹ (1927)		13	0
Young ²⁰ (1929)		40	0
Johnson ²¹ (1930)	Novocaine	25	0
		340	

*Includes 132 pelvic operative deliveries.

It must be remembered that spinal anesthesia has not been extensively used in obstetric clinics, and that its use in many cases has been confined to patients regarded as poor risks. The recent series reported from any one clinic, where this method of anesthesia was used, are necessarily small as compared with the larger surgical series. Also the drug used, the dosage and the technic of induction have varied greatly. These are important considerations in attempting to compare results.

Spinal anesthesia may be used in abdominal obstetric operations, with certain exceptions, in those cases in which general inhalation anesthesia is contraindicated, or would add to the gravity of the underlying pathology. Babcock^{12, 15} has demonstrated through long experience that this method must be selective and that it is unsuited for patients in poor physical condition. Careful choice of the patient risk is more important than any other part of the procedure. Until further evidence of the safety of spinal anesthesia has accumulated, its routine use in operative obstetrics should be discouraged. Local infiltration anesthesia has been advocated by Irving,²² DeLee²³ and others, for these same conditions. There is no doubt that local infiltration anesthesia carries less risk, but on the other hand, its induction is tedious, time consuming, and in nervous and apprehensive patients, especially, it constitutes an unsatisfactory anesthetic. After a limited but definite experience with both, the preference of the author is for spinal anesthesia when there is reasonable indication for its use.

In preeclampsia, which has not responded to treatment, or which is of the fulminating type, cesarean section is, in certain instances, a preferable method of delivery.³¹ From the work of Stander,²⁴ it is evident that in the toxemias of pregnancy, general anesthesia for operative procedures should be replaced by either local infiltration or subarachnoid block. The rapidity with which anesthesia can be induced, and the operation performed, is of real value in the treatment of fulminating preeclampsia. The lumbar puncture diminishes the cerebrospinal fluid pressure, and the fall in blood pressure following spinal anesthesia accomplishes automatically that which we attempt to obtain by symptomatic treatment. Suppression of urine has not been noted, and the ability of the patient to take fluids immediately postoperative is important. Astley,¹⁹ Johnson,²¹ and Young²⁰ have all reported gratifying results on the use of spinal anesthesia for cesarean section in the late toxemias of pregnancy.

Of the acute diseases of the urinary tract during pregnancy, pyelitis, and

pyelonephritis are most commonly met. If the infections are severe and abdominal operative procedures are indicated, the use of spinal or local infiltration anesthesia is well suited. If careful preoperative preparation by the use of fluids is made, these patients, in general, tolerate spinal anesthesia well.

Nephritic toxemia, or pregnancy complicating a preexisting nephritis, frequently presents a serious obstetric problem. These patients, also, represent in general, serious operative and anesthetic risks. Often it is considered advisable to terminate the pregnancy by the abdominal route.

Under spinal anesthesia the blood pressure fluctuations in this group have been the most extensive. This is presumably due to the peripheral arteriosclerosis associated with the nephritis. No harmful sequelae attributable to these blood pressure changes have been observed. However, it was felt that the margin of safety in these cases, was less than in other groups.

In the nephritic toxemias, it is especially important that fluids be forced preparatory to operation. These patients in many instances, are in poor nutrition and if edema is present, do not seem capable of utilizing this fluid. Fluids up to 3,000 c.c. should be administered in the twenty-four period preceding operation. If the patient will take liquids freely by mouth, palatable drinks containing 10 to 20 per cent glucose supply the fluid in an excellent form. If fluids are not well taken, or if the operation is an emergency, the use of 10 per cent glucose intravenously, or saline by hypodermoclysis will supply the need.

Not only is this preparation designed to produce increased elimination through diseased kidneys, but also to make the patient a better surgical and anesthetic risk. If spinal anesthesia is used, it also provides a supply of fluid for the vascular system, with which to cushion the depressive circulatory changes. In the nephritic toxemic group, I believe that spinal anesthesia should be limited sharply to those patients who present at least a fair surgical risk.

Patients who present high nitrogen retention, evidence of marked sclerosis or visual defect symptoms, in the author's opinion are preferably delivered under local infiltration anesthesia, if abdominal operation is indicated.

Pregnancy complicating essential hypertension is not infrequently seen. Those cases not complicated by definite arteriosclerosis or chronic nephritis are suitable subjects for spinal anesthesia. In those presenting the malignant form, i.e., extreme hypertension and evidence of renal damage, the use of local infiltration anesthesia is most desirable.

Diabetes mellitus is occasionally complicated by pregnancy. The development of large babies under these circumstances is well known. Cephalopelvic disproportion is a common indication for primary cesarean section in this group. Other coexisting organic diseases may demand interruption of the pregnancy and sterilization.

Joslin²⁵ has shown that spinal anesthesia is a useful method in diabetic surgery. In the few diabetic cases in which the author has used this method, it has shown satisfactory results.

The choice of the anesthetic in pregnancy complicating cardiac disease seems no different than the same considerations as applied to general surgery. Sise²⁶ has stated the situation as follows: "Valvular disease without serious myocardial involvement affects the choice of the anesthetic very little if there is not decompensation, and even with mild decompensation, offers surprisingly little difficulty with all forms of anesthesia. In these latter cases, however, any raising of blood pressure is to be avoided. Spinal anesthesia is, therefore, less suitable and regional anesthesia becomes the preferred choice, though spinal anesthesia and the gases with ether may also be employed."

The author has observed two cases of acute myocardial failure in patients with preeclampsia who had presented no previous history or evidence of cardiac disease.

Abdominal delivery of this type of case as well as those of severe congestive failure in pregnancy, he believes, is best effected by the use of local infiltration anesthesia supplemented by inhalation of oxygen-ether mixture if necessary. The use of the heavy spinal solution in cardiac failure has been recommended by Pitkin.²⁷ This necessitates elevation of the head and shoulders during the anesthesia, and is the only position in which these patients are comfortable. If, under these circumstances, however, circulatory depression appears, one of the greatest aids in preventing respiratory failure, i.e., Trendelenburg position, is contraindicated.

The acute and chronic respiratory diseases contraindicate the use of ether by inhalation. The incidence of postoperative pulmonary complications is diminished by the use of spinal or local anesthesia.²⁷ That these forms of anesthesia are superior to nitrous oxide-oxygen or ethylene, in this respect, has not been proved by statistics, but is generally acknowledged.²⁹

In extremely obese patients, lumbar anesthesia presents definite advantages over general inhalation anesthetics. It is well recognized that obesity has frequently associated with it metabolic and organic changes, which make those affected less desirable anesthetic risks. Again, those who present extreme risks should have local infiltration anesthesia, if possible.

In general, the use of spinal anesthesia is contraindicated in conditions in which actual shock or hemorrhage exists or where there is imminent danger of its occurrence. Circulatory depression of varying degrees, cannot accurately be prognosticated with spinal anesthesia, and no method should be used which will tend to accentuate the effects of shock.

In uteroplacental apoplexy, a condition usually accompanied by a toxemia of pregnancy or by chronic nephritis, delivery may be best effected by cesarean section.³¹ Characteristic of this condition is the extreme and progressive shock which follows the separation of the placenta and which is out of all proportion to the uterine hemorrhage. Because there is usually renal involvement, the use of local infiltration anesthesia, with nitrous oxide-oxygen if necessary, seems at present the most desirable. These patients in many instances are desperate risks requiring transfusion either before or during operation, or both. Spinal anesthesia, in my opinion, is definitely contraindicated in this condition.

The presence of placenta previa in which abdominal delivery is indicated does not in itself constitute an indication for the use of spinal anesthesia. Theoretically, the relaxation of the lower uterine segment which occurs would present a real difficulty in the control of hemorrhage after removal of the placenta. Ginglinger and Assovat³⁰ state that there is no foundation for this fear and report with encouraging results 13 cases of cervical cesarean section for this condition under lumbar anesthesia.

PERSONAL EXPERIENCES

The series of cases in this report consists of 121 abdominal obstetric operations performed under spinal or attempted spinal anesthesia, during the years 1927, 1928, and 1929. Eighty-nine were performed at the Boston Lying-In Hospital. The remaining group consists of private patients of various obstetricians who have kindly made their records available, and of patients in the author's own practice. In the majority of the hospital series, and in all the private cases, the anesthesia has been personally induced or observed.

Preparation of the patient for anesthesia has consisted of the almost routine administration of morphine ($\frac{1}{6}$ gr.) and scopolamine ($\frac{1}{150}$ gr.) hypodermically, one-half hour prior to operation. No unfavor-

able results either to the mother or child have been noted. A few babies were apneic immediately after delivery, but in less percentage than after inhalation ether. If the patient was awake and apprehensive at the time of spinal induction the scopolamine was repeated.

In this series, a routine hypodermic injection of ephedrine sulphate, 0.05 gm. was given approximately five minutes before spinal induction. This dosage has proved satisfactory where only lower abdominal anesthesia was desired. In one instance only was it repeated during the operation, and then in 0.025 gm. amount. Epinephrine was used twice during operations because of extensive blood pressure fall. Novocaine, either in the form of spinocaine (Metz) or novocaine crystals (Metz) has been used exclusively.

Spinocaine was used 107 times. The average dosage represented 0.20 gm. of novocaine. The technic of Pitkin was strictly followed and good results were obtained with this solution. The novocaine in crystal form was used fourteen times with satisfactory results. The dose averaged 0.125 gm. The technic was so similar to that already described by Stout¹³ that for further information the reader is referred to his excellent article.

Seven complete failures, 5 per cent, occurred in this entire series. Intraspinal reinjection of one-half the original dose of the drug produced successful anesthesia in three of these instances. Supplementary anesthesia was necessary twelve times, 7 per cent. In a few instances this was not necessary, except for the psychic effect upon the patient. The operations performed, as well as the indications for anesthesia, are shown in Table II. Of the 82 cesarean sections, 34 were of the classical and 48 of the low cervical type.

TABLE II

INDICATIONS	CESAREAN SECTION	ABDOMINAL STERILIZATION	HYSTERECTOMY OF PREGNANT UTERUS	ABDOMINAL HYSTEROTOMY AND STERILIZATION
Chronic nephritis	6	3	7	4
Pyelitis	2	1	0	0
Tuberculosis	0	0	0	2
Acute coryza	7	0	0	0
Tuberculosis	1	2	1	2
Asthma	2	0	0	0
Cardiac disease	4	1	4	3
Toxemia of pregnancy	17	0	1*	0
Ablatio placentae	4	0	0	0
Pernicious vomiting	0	0	2	2†
Essential hypertension	1	0	0	0
Diabetes mellitus	3	0	0	2
Epilepsy	0	0	1	1
Elective	35	0	0	0
Total	82	7	16	16

*Ruptured Uterus.

†No Sterilization.

It will be noted that 35 cesarean sections were performed under "elective indications." These patients were all normal and used as a control series. In view of the possibility of certain dangers which became apparent after experience with this method, and because it was felt that spinal induction should be limited by strict indication, its use in this type of case was abandoned until further data had accumulated.

The blood pressure fluctuations varied in different patients with identical doses of the drug and a standard technic of administration. This, however, is not surprising when we consider that vascular hypertensive conditions were present in a moderate proportion of these patients. Blood-pressure observations were made at five- to ten-minute intervals during the operations. Large fluctuations in the diastolic pressure were considered more important than in the systolic, and stimulative treatment was carried out on this basis.

A rise in blood pressure immediately after delivery of the child was observed in 80 per cent of the 82 cesarean sections reported. Unfortunately, this postnatal blood pressure elevation seemed to occur with less frequency in those instances in which a large blood pressure fall had already transpired. Since these particular cases presented the worst risks, the practical importance of this phenomenon is greatly vitiated.

The postoperative complications which occurred are tabulated in Table III, and are self-explanatory.

TABLE III

COMPLICATION	NUMBER	PERCENTAGE	REMARKS
Vomiting	3	2 %	One developing intestinal obstruction
Mild distention	21	17 %	
Moderate distention	11	9 %	One developing intestinal obstruction
Marked distention	3	2 %	
Headaches	5	4 %	All responded to sedatives
Meningismus	1	0.8%	Duration three days
Pulmonary edema	2	1.6%	(a) Mild decompensated cardiac disease (b) Preeclampsia
Urinary retention	1	0.8%	Required two catheterizations

In this series of 121 patients, six postoperative deaths occurred. Brief case histories are appended.

CASE 1.—Admitted as emergency. Para iii, forty-two years. Diagnosis: utero-placental apoplexy. Blood pressure 190/130 on admission, beginning shock. After administration 2 c.c. of spinoecaine, blood pressure dropped to 100/70. Classical cesarean section duration forty minutes. At beginning of operation level of anesthesia 2 inches above umbilicus. During operation, blood pressure continued to drop. Adrenalin hydrochloride 15 minims intravenously, and intravenous saline started. At the end of operation blood pressure was not obtainable. Two transfusions each of 500 c.c. citrated blood given immediately. Patient revived, became conscious, and blood pressure returned to 60 mm. Hg, two hours after operation. Following this, patient relapsed into shock and died four hours from the end of operation.

CASE 2.—Para vi. Low cervical cesarean and sterilization performed on patient with severe rheumatic heart disease and bilateral pyelitis. Spinocaine 2 c.c. Patient died on thirty-fifth day postoperative. Diagnosis, septicemia.

CASE 3.—Para ii. Repeat low cervical section. Elective spinal 2 c.c. of spinocaine. Death on eighth day postoperative. Diagnosis, general peritonitis.

CASE 4.—Para iii. Chronic nephritis with hypertension. Abdominal hysterectomy and sterilization. Pregnancy three and one-half months. Blood pressure 280/190. Spinocaine 2 c.c. Patient in fair condition at end of operation and remained so until four hours postoperative, when she had a few convulsive movements of face and legs, and died. Diagnosis, cerebral embolus. Autopsy not permitted.

CASE 5.—Para i. Decompensated cardiac disease. Hysterectomy of the early pregnant uterus. Spinocaine 2 c.c. Patient died on the third day postoperative of cardiac failure.

CASE 6.—Para i. Chronic active pulmonary tuberculosis. Hysterectomy of early pregnant uterus. Patient died seven days postoperative. Diagnosis: pulmonary tuberculosis.

In this mortality group no questionable connection between the anesthetic used and fatal result exists, except in the instance of Case 1. This patient, in my opinion, did not die in respiratory failure or directly from effects of the drug. How much the spinal anesthetic contributed to the existing shock which resulted from the uteroplacental apoplexy and operation, is another question. The fact remains that the choice of anesthesia, my own, in this case was not a judicious one, and serves to illustrate the danger of lumbar anesthesia under these circumstances.

CONCLUSIONS

1. Spinal anesthesia has a definite place in abdominal obstetric surgery when the use of general inhalation anesthesia is contraindicated.
2. The method is safe only with judicious selection of risks, a careful technic of induction, close observation of the patient during anesthesia, and preparedness for any unfavorable reaction.
3. Spinal anesthesia is contraindicated in desperate risks or in conditions in which either shock or hemorrhage is present.

I am deeply grateful to the various obstetricians who have made their private records available to me for this study.

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19 BAY STATE ROAD.

PRIMARY CHORIOCARCINOMA OF THE FALLOPIAN TUBE, WITH THE REPORT OF A CASE

By HERBERT E. STEIN, M.D., NEW YORK CITY, N. Y.

THE subject of chorionic tumors is one of great importance, particularly as these growths entail so much danger to the patient. Saenger gave the first clinical picture of the disease in the uterus, Fraenkel and Marchand proved that the cellular elements of the chorionic villus produced the growth. Thus it is fetal in origin and can therefore occur only during pregnancy. Ewing and others have made valuable contributions. After a careful survey of the literature I could find only 19 authentic cases of primary chorionepithelioma or carcinoma of the fallopian tube. The appended case is therefore reported. Hartz makes the statement that 3.5 per cent of all choriocarcinomas occur in the tube. Kelly asserts that this condition following ectopic pregnancy is about as frequent as choriocarcinoma following intrauterine pregnancy.

All embryonic tissue has a potential malignant tendency as shown by its invasion of the tissue at the site of nidation and its dissemination distal thereto. This latter is evident from the presence of chorionic cells in the pulmonary capillaries even in normal pregnancy. The maternal organism, therefore, must possess some inhibitory agency which prevents the extension of this malignant tendency; or what is more probable, there is a difference in the degree of malignancy of the cells constituting the tumor.

The normal villus consists of a connective tissue stroma, covered by two layers of cells, the inner usually a single layer of Langhans' cells, the outer thicker syncytial layer, containing many vacuoles. By an intensive, destructive invasion of the uterine tissue, the villus burrows into and becomes attached to the former. At the line of demarcation a fibrinous reaction takes place, the so-called membrane of Nitabuch. If the invasive process terminates here, normal pregnancy supervenes. If not, one of four conditions may take place: 1. The formation of simple *hydatidiform mole*, consisting of an active proliferation of the syncytial layer with preservation of the connective tissue core. Mucous

edema gives the characteristic vesicle appearance. There are no new capillaries formed, there is no active destruction of maternal tissue nor tendency to metastasis. This type of growth usually separates and is spontaneously expelled. 2. *Choreoadenoma destruens of Ewing*, which is similar to the ordinary mole but with greater tendency to deeper invasion and separation of the uterine tissue. However the epithelial cells do not break through the limiting connective tissue barrier nor is there metastasis. 3. *Typical malignant form*. Both layers of cells undergo malignant changes but either one may predominate. Large cellular masses are seen, marked destruction and vacuolization takes place. The cells show marked mitosis. The chief characteristic is the disappearance

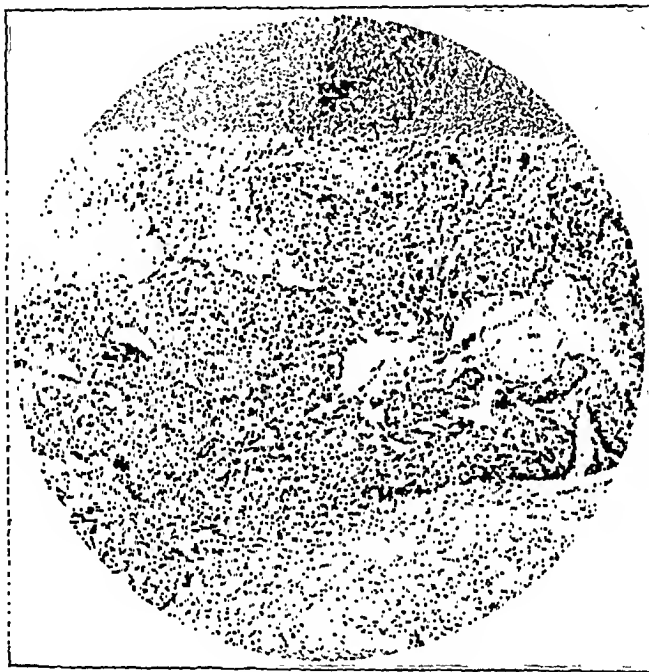


Fig. 1.—Choriocarcinoma. ($\times 100$).

of the connective tissue stroma. Metastases take place via the blood vessels. This form is extremely malignant. 4. *Malignant syncytioma of Ewing*. Instead of both cellular types being represented, the tumor is formed exclusively of syncytial cells. This is much more benign, even metastases undergo retrogression after removal of the primary growth.

It is questionable whether this same classification can be applied to choriocarcinoma as it appears in the tube. However, two recoveries in the series may be traced to the occurrence of the relatively benign form.

The theory has been advanced that hydatidiform degeneration seems to be related to a gradual waning vitality of the germinal cells. This seems contradicted by the fact that the majority of the patients were below thirty-five years of age and one even of seventeen. The author's patient was the oldest of the series, forty-six years. Contrary to the

usual history of sterility or one child sterility, as obtains in extrauterine pregnancy, most of the cases of chorioepithelioma of the tube were not only multipara but had a high degree of fecundity, one being a para viii. In the case herewith reported the patient had her last child nineteen years ago.

No case has ever been correctly diagnosed, most of them being mistaken for extrauterine pregnancy, some for ovarian tumors or pyosalpinx. The usual history is that of amenorrhea over a period of six to twelve weeks, severe colicky pains, attacks of syncope followed by irregular uterine bleeding. In a few cases there was a quiescence of symptoms for a few months and in most of them a rather characteristic

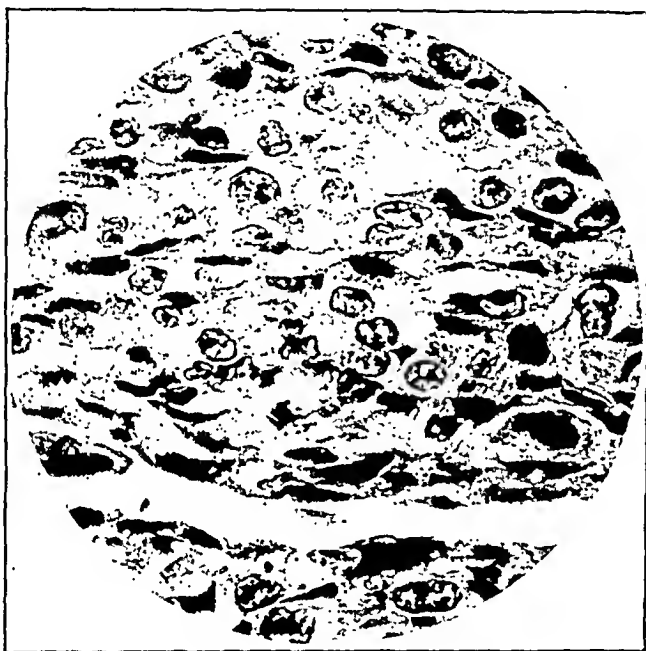


Fig. 2.—Chorioepithelioma. ($\times 700$).

progressive asthenia supervened. In the case reported, the patient discharged a decidua forty-eight hours after laparotomy. Section confirmed the nature of the tissue, thus proving that nidation and malignant change had not taken place primarily in the uterus. If there is pulmonary involvement, there may be expectoration of blood-tinged mucus or actual hemoptysis. Bowel involvement may occasion hemorrhage and partial or complete obstruction may be produced by pressure from the tumor.

Physical examination, aside from general findings of asthenia with possible beginning signs of cachexia, usually elicits localized tenderness over the site of the tumor, which may or may not be mapped out, depending upon its growth out of the pelvis. Vaginal examination, in a few cases, elicited a secondary growth in the vaginal wall. Recognition

of its nature is of great aid in arriving at a proper diagnosis. Although these occur more frequently by implantation secondary to uterine chorio-epithelioma, three cases of tubal chorio-epithelioma have shown this vaginal involvement. The uterus may be of normal size, position and consistency or slightly enlarged and softened as is frequent in extrauterine pregnancy. A mass is almost always palpable in either fornix, rather closely applied to the uterus and moderately tender and fixed.

The prognosis is very poor, only two cases in the whole series having recovered. The tumor disseminates either by continuity or through the blood stream. If mostly through the portal system, the liver is involved early; otherwise the lung shows most marked metastases. One case recovered in whom the primary mass only was removed, it being impossible to remove the metastases. It must therefore be remembered that very rarely these secondary deposits may undergo retrogression after removal of the primary growth. Death may be due to cachexia, involvement of lung or liver, copious hemorrhage or intestinal obstruction. Patients rarely live longer than a few months after operation.

The earlier the operative intervention, the better the prognosis and the simpler the operation. If the tumor is still confined to the tube, simple unilateral salpingo-oophorectomy is probably sufficient. If the median half of the tube is the seat of the tumor, it is wiser to do a complete hysterectomy, as the uterine mucosa or wall may be secondarily involved by continuity. If the mass is adherent to the intestine, the presumption should be that it is not a simple adhesion but that the malignant cell has already invaded the intestinal wall. A resection is therefore indicated as extension progresses very rapidly. It is questionable whether liver involvement contraindicates any operative procedure.

A valuable lesson to be learned is the inadvisability of doing a conservative operation on a tube that is the seat of pregnancy. This has lately been advocated especially in cases which at the time of operation have ceased bleeding, the tube being apparently free of all products of conception. This procedure cannot be too strongly condemned. First, the tendency of repetition of ectopic gestation is well known, and second, the incidence of malignancy in embryonal tissue must always be borne in mind. Every tube the seat of pregnancy should be totally removed, preferably with a cornual resection.

The recognition of the nature of the tumor is not difficult, if one is on the lookout for it. It occupies the upper part of the broad ligament, varies in size depending on its age and very early becomes firmly adherent to surrounding structures. Most tumors have a very fine capsule which is the remnant of the thinned out tube. The tumor is usually lobulated and dark red, being very vascular and containing considerable blood clot intermingled with or covering the tumor tissue. The latter is grayish white or yellow and very friable, resembling

placental tissue. The secondary growths show the same lobulated appearance.

Section shows characteristic, large protoplasmic masses, usually vacuolated and containing numerous, deeply staining nuclei. These are the syncytial cells. In other sections are numbers of round cells, containing a single nucleus, representing Langhans' layer. In areas at which the tube wall is not too attenuated, the muscle tissue of the latter may be recognized. Many of the sections show large hemorrhagic areas containing degenerated cells.

CASE REPORT

Patient C. A., white, aged forty-six, married. Her chief complaint was abdominal pain, weakness and vaginal bleeding. The family history was negative as to cancer and tuberculosis. Aside from an operation for varicose veins, complicated by pneumonia, she has always been in good health. Menstruation began at twelve, regular, every twenty-eight days, lasting four or five days, rather profuse. The last few years the periods have been more frequent and of longer duration. She has had two normal pregnancies and labors, the last one nineteen years ago. No miscarriages.

In February 1929, she had a normal period, missed the one of March, but normal again in April, May and June. Since then there has been almost daily bleeding up to date (Nov. 22, 1929). She has suffered moderate lower abdominal pain, remaining localized, since July. Weakness has been experienced during the past three months, without any loss of weight.

Physical examination revealed a rather obese woman, not acutely ill. No abnormal findings or reactions of head or neck. Heart not enlarged, sounds regular, no murmurs, pulse 80 and regular, blood pressure 140/80; vesicular breathing, no râles. The abdomen was large and pendulous, a hard mass made out apparently springing from the pelvis, tender, movable and lying more to the left. Both flanks were dull to percussion. Vaginal examination elicited a firm mass to either side of the uterus, closely adherent to and moving with it. The left leg was swollen and edematous, scars of the old operation being visible. General reflexes were active and equal. The urine, on occasion, showed slight traces of albumin and sugar and many red cells. The tentative diagnosis was fibroid uteri, ascites or malignant ovarian tumor.

Laparotomy was performed under spinal anesthesia, neocaine (0.12). There were very firm intestinal adhesions down to a mass in the pelvis, apparently connected to the left tube, about five inches in diameter, irregular, filled with blood clots and placental-like tissue. The uterus was enlarged, about four inches in diameter and distinctly softened. The right tube was slightly thickened and the fimbria closed. The right ovary contained a small cyst. In places there was a suggestion of a capsule surrounding the mass. The adhesions were separated with considerable difficulty, the tumor mass delivered and removed. Right salpingo-oophorectomy was performed, leaving a stump of the right ovary. The abdomen was closed in layers without drainage.

The first day postoperative the patient coughed considerably, due to a small area of consolidation at the right base, which cleared up within a week. On the second day she discharged some tissue from the vagina which seemed to be a decidual cast. Vaginal bleeding ceased on the sixth day. She left the hospital on the fourteenth day, wound healed by primary union, moderate induration in

the left fornix. X-ray examination of the chest at this time failed to reveal the presence of any metastasis.

Pathologic report: Specimen consisted of a mass measuring about $10 \times 7 \times 5$ c.m., made up of ovary, tube and broad ligament. On section it appeared at places hemorrhagic, at places granular. This latter was yellow, friable and looked grossly malignant. Section showed extensive tumor necrosis, in general appeared like decidua tissue, containing numerous giant cells, The picture is that of a highly malignant tumor, choriocarcinoma.

Section of tissue expelled from vagina is that of normal decidua, no evidence of malignancy or hydatidiform mole.

The patient did quite well for two weeks after leaving the hospital. Then she began to complain of generalized abdominal pain, weakness, and occasional cough. There had been no vaginal bleeding since the eighth day postoperative. The hard induration in the left fornix was still present and the fundus uteri much smaller. Three weeks later there was occasional bloody expectoration, a tender mass was palpable in left umbilical region, no vaginal changes noted. She was referred to the General Memorial Hospital for radiation, died suddenly the following day, about seven weeks postoperative.

The autopsy showed: "Metastases to the liver and abdominal nodes, partial intestinal obstruction from pressure of tumor, extensive hemoperitoneum (hemorrhage from recurrent tumor mass, the immediate cause of death), decidua reaction in uterus. Sectional congestion of bronchi but no tumor of lung."

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REPORT OF A DOUBLE MONSTER, ISCHIOPAGUS*

BY SAMUEL LUBIN, M.D., BROOKLYN, N. Y.

Patient, E. S., thirty-five years of age, an American Jewess, was admitted to the Prospect Heights Hospital on the nineteenth of August, 1930, in active labor. She had been married eight years, had always enjoyed good health and had never undergone any surgical operations, although she had uterine fibroids, discovered during routine pelvic examination several years before, and had never received treatment of any kind including irradiation.

Her menstrual history was essentially negative, her last menstrual period November 24, 1929.

There were two previous pregnancies, one having terminated in a spontaneous two months' miscarriage over six years previously. The second pregnancy resulted in a full-term living female baby, weighing 7 pounds, delivered by forceps because of a prolonged labor, five years ago. This child was born with a ptosis of the left lid and an internal strabismus of the left eye which still persists, although the youngster enjoys very good health and mentality.

The present pregnancy was uneventful. The membranes ruptured spontaneously at 11:00 P.M. on the eighteenth of August, 1930, followed by the onset of labor at 11:30 P.M. The pains began coming rather frequently almost from the onset, and at 12:00 o'clock were about two minutes apart, very painful, and with considerable pressure on the rectum. The patient was admitted to the hospital at 12:30 A.M. on the nineteenth of August, 1930, with pains every minute, and the head on the pelvic floor. The abdomen seemed to be rather large, considering that the membranes had ruptured one and a half hours before. One fetal heart was heard in the left lower quadrant with a rate of 144 per minute. The position could not be determined abdominally. Vaginally, the head was on the pelvic floor with the sagittal suture in the right oblique diameter, and the small fontanelle at the left iliopectineal eminence. Because of the rapidity of progress and the severe pain associated with the uterine contractions, ether was administered with each pain when the perineal stage was started. In spite of the strong uterine contractions, the head seemed to advance slowly and finally delivered itself spontaneously at 1:30 A.M., followed by the shoulders. Following this, difficulty was encountered; the hips would not deliver. By passing the fingers along the hips, a very marked widening of the fetal breech was felt which suggested the possibility of a monster. By sweeping the fingers around to the back of the fetus which was on the left, a hard protruding member was felt which was delivered under the symphysis by bending to the right. This was followed by one pair of legs which were helped over the perineum with moderate difficulty, and was continuous with an after-coming trunk. With considerable effort the shoulders were delivered, the anterior shoulder first. Then the after-coming head would not budge with traction from below or pressure from above; therefore forceps were applied. As the handles were being locked, a gush of clear liquid resulted which later proved to be from the crushing of a hydrocephalic head. A right medio-lateral episiotomy was performed and the head delivered with moderate traction on the forceps below and pressure from above. During the latter part of the procedure ether anesthesia was given to the surgical degree. Although the fetus was stillborn, it is possible that the first baby made several respiratory movements.

*Presented before the Brooklyn Gynecological Society, April 3, 1931.

The placenta was expressed after the signs of separation appeared at 1:50 A.M., and seemed to be perfectly normal, and 1 c.c. of pituitrin was given hypodermatically. The episiotomy was repaired immediately, using No. 2 chromic catgut. There were no gross cervical lacerations and no tendency toward an atonic uterus.

There was an uneventful recovery, the patient getting out of bed on the tenth day and going home on the thirteenth day. During her stay in the hospital all laboratory findings were essentially negative, including the blood Wassermann test.

The patient presented herself at the office for postpartum examination six weeks following her discharge from the hospital. In the meantime there were two menstrual periods, the first starting on the twenty-second of September, lasting five days, and the second starting on the sixth of October, also lasting five days. Pelvic examination showed a well healed perineum; a cervix in the axis of the vagina and essentially negative; the fundus was in the midline, firm, freely movable, about the size of a six weeks' gestation, and studded with pea- to marble-sized fibroids; the fornices presented no gross pathology.



Fig. 1

A study of the specimen revealed the following: A double monster joined at the pelvis (ischiofagus), consisting of two heads, two pairs of arms, two trunks and one set of male genital organs, set upon one pair of well formed lower extremities. With the trunks in a straight line, the monster measured $22\frac{1}{2}$ inches from the top of the heads. The total weight was $8\frac{1}{2}$ pounds (minus the fluid which escaped from the crushed hydrocephalic head of baby No. 2). The head of baby No. 1 was well formed and anatomically correct, while that of baby No. 2 was a hydrocephalic associated with a double harelip, cleft palate, and a rudimentary right eye which was represented by a folded slit.

There existed an eventration through an opening about two inches in diameter, in their common abdominal wall, with an exposure of the small intestine and what apparently was liver; the umbilical cord entered through the left inferior border of this opening.

The arms of both parts were well formed as also were the one pair of common lower extremities and the male genital organs, which were normally situated with the anal opening behind.

Coming off for a length of five inches from the joining of both spinal columns posteriorly was a skin-covered bony structure which tapered from the base, which was about one inch in diameter, to the end, which was about one-quarter inch in diameter, and had a joint one-third inch from the tip. This apparently was a rudimentary lower extremity and will be described further in the x-ray report.

On autopsy by Dr. L. Albert Thunig the following was noted:

Baby No. 1. A normal sized thymus gland. The lungs were normally developed and showed evidence of having functioned. The diaphragm was completely formed, separating the abdominal from the thoracic cavities. The heart showed a patent foramen ovale in a very thin-walled interauricular septum. The ductus arteriosus was closed. The heart valves were well formed.

Baby No. 2. Thymus was quite small, but larger than the size of the heart. The lungs were contracted, small, and the surface was granular. The right lung showed an ill-defined middle lobe, and the left a poorly defined cleavage between the upper and the lower. On section they were solid and contained a frothy serum showing evidence of this baby having breathed. The diaphragm was completely



Fig. 2

intact, separating the abdominal from the thoracic cavities. The heart appeared to be embryonic, being only three-quarters inch long, one-quarter inch thick, and one-half inch wide with a typical cone-shaped embryonic left ventricle. The right ventricle was a small mass about one-quarter inch in size on the anterior surface of the heart and had no openings into its cavity, and was purely rudimentary. There was complete absence of the right auricle. There was no valve formation, between the left auricle and ventricle, but there were two pulmonary veins emptying into the left auricle which was only rudimentary. The vena cava emptied into the junction of the rudimentary pulmonary artery and the arch of the aorta. The heart of this baby was merely a tubular organ which served no function other than that of a blood vessel, through which the blood passed, and the circulation was maintained by the heart of baby No. 1.

The common abdominal wall presented an opening about two inches in diameter, through which there was an evisceration of small intestine and part of the liver from each fetus. There was one small intestine in each fetus which joined in the ileum to form a double cecum which passed upward into a single ascending colon. Each segment of the bifurcated cecum had its own appendix attached.

The spleen, stomach and pancreas appeared grossly normal on both sides. The liver of baby No. 2 is about one-quarter the size of that of baby No. 1.

There was one large fused kidney with one ureter coming from a single pelvis situated centrally on the ventral surface. The bladder was normally situated, was thick and hard, and contained one-half ounce of urine when opened. The urethral orifice was visible, but could not be probed, probably due to formalin hardening. There was another large kidney on the right side of baby No. 2 which was anterior and closely adherent to the liver, was markedly cystic at the lower pole, and had one ureter which emptied into the bladder.

From the autopsy findings it seemed as though baby No. 1 was almost a normally developed baby, and furnished the heart action for both babies. Baby No. 2 showed a great many abnormalities and was dependent on baby No. 1 for its blood supply. Even though from outward appearances this monster appeared symmetrical, each section equally developed, yet the autopsy findings would suggest a parasitic tendency from the standpoint of circulation on the part of baby No. 2 to its host. The circulation of both babies was joined at the pelvic brim which harbored a common iliac artery and an accompanying vein which was continuous with the abdominal aorta and the inferior vena cava, respectively, in each fetus.

The blood coming from the placenta through the umbilical vein in the major portion made its way to the heart of baby No. 1, whence it was propelled to the tissues of the entire monster and also back through the umbilical arteries to the placenta.

The placenta presented no gross abnormalities. There were no infarcts, accessory lobes, cysts, extravasation of blood, calcareous degeneration, or other conditions which might tend to attribute the cause of the monstrosity to some systemic condition in the mother, or to a local condition in the placenta.

Roentgenologic examination by Dr. Frederic E. Elliott showed two fairly normal fetal skulls; two complete spinal columns with normal development of the upper shoulder girdle and upper extremities. The pelvic girdle of each fetus was lost in a confused conglomerate, purposeless bone formation. The lumbar spines of each fetus entered into this mass from the opposite axes of the spines. On one side were the normal bony structures of the lower extremities without, of course, normal articulation to the pelvic girdle, and between these extremities could be seen the soft parts of a male fetus. On the opposite side was a single extremity with a well-developed fetal femur and rudimentary bone development of the tibia was seen. In other words, there is the image of a monster, the heads, upper extremities and bodies of each appearing fairly normal, with a disorderly fusion of the pelvic girdles, from one side of which was a well-developed, normal set of bones for the lower extremities and on the other side a rudimentary single thigh and leg formation.

The author wishes to express his appreciation to Dr. L. Albert Thunig and Dr. Frederic E. Elliott for their great cooperation in the pathological and roentgenological examinations.

777 PROSPECT PLACE.

REPORT OF A CASE OF ABNORMAL FETUS FOLLOWING RADIATION OF THE MOTHER

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THE effect of radiation on the oncoming progeny remains a much mooted question. Various suppositions have been offered as explanations for the birth of abnormal children of radiated mothers. Abnormal children have been born following the radiation of the mother, but then, too, radiated mothers have given birth to normal offspring as reported by Williamson, Rubin, Kane and myself.

It is axiomatic in radiation therapy that the more embryonic the tissue the more sensitive it is to the effect of the x-rays. A fetus, being obviously most embryonic in character, should therefore be extremely sensitive to x-rays. The age of the fetus has a great deal to do with the degree of sensitiveness as is evident from the report of the births of a number of children following radiation applied to them in utero. Moreover, examination of several fetuses removed from the uterus following irradiation of the mother showed the embryo unharmed by the rays. It is no doubt reasonable, however, to assume that a very early fetus formation in utero is definitely destroyed by the x-rays. Parkes claims that the termination of pregnancy is the most striking result at that period. This has been shown in such cases where the x-rays had been used to abort a pregnant mother, as reported by Wyser and others. In the treatment of amenorrhea and sterility the x-rays have been used as a stimulating agency and children born following such treatment of the mother had been normal and healthy. For this reason the birth of the abnormal child in the case herewith reported is of especial interest.

L. M., married, aged twenty-seven, has one child four years old. Since age of eighteen had been under treatment by a competent gynecologist for irregular menstruation, miscarriage, and sterility. She miscarried in March, 1929, menstruated in May, 1929, and September, 1929, her last menstruation occurring in November, 1929, and none appearing up to April, 1930. Radiation was suggested in that month. Before receiving x-ray treatment she was examined by her gynecologist and the presence of gestation in the uterus was not noted. The patient herself stated she was not pregnant. Accordingly x-ray therapy was given on April 9, 15, and 22, a total dose of 12 per cent being delivered to the ovaries. A month later the patient reported that evidently no action had followed the x-ray treatment. In June she reported being pregnant, went into labor November 1, and was delivered of a stillborn child which was abnormal in form. Described by the attending physician as follows: Stillborn monstrosity, hydrocephalic, distorted atrophic features, rudimentary nares, body fairly well developed, extreme polyhydramnios present.

The question arises as to the cause of the malformation of the fetus. Was it a postradiation pregnancy? Was the patient already pregnant at the time of radiation and did the x-rays adversely affect the fetus in utero? Why did not the irradiation of the patient abort the damaged embryo? Why did not the embryo fail to develop if it were damaged at its inception? Why did the patient and the gynecologist fail to note the pregnancy earlier?

We can only offer suppositions in reply, since no definite knowledge is as yet available as to the reason for monstrous formation of the fetus in women who have never had radiation. The statistics from DeLee, Case and Cooper, and Hirst indicate that monsters are a frequent occurrence in the ordinary run of obstetric cases.

Did pregnancy in this case occur in a damaged ovum? In our experience we have had many examples of healthy normal children being born of mothers who became pregnant shortly following the administration of the same type of x-ray therapy as given to this patient, as reported by Rubin, Rongy, Schmitt, Bollaffio, Doderlein and myself. But the possibility of a damaged ovum becoming fertilized cannot, however, be ruled out. Since, as already stated the more embryonic the tissue the more radiosensitive it is, we may suppose that this patient may have become pregnant at the time of irradiation and the newly-formed embryo was so sensitive to irradiation as to be definitely damaged thereby. On the other hand, if the embryo is so sensitive to irradiation, then according to workers who have studied the abortive effects of x-rays, this fetus should have been extruded dead following treatment.

From this patient's clinical history, and sterility, it would appear that the embryo in all probability would not in any case have developed normally. Whitehouse says that any change in the environment will alter the development of the normal fetus. One of the established causes for the birth of monstrosities is the change of environment in the birth canal due to the long period of sterility before conception. Mall states that the faulty implantation of the ovum causes an imperfect formation of the fetal coverings and that this faulty implantation is due to some condition of the uterus and the result may produce monstrosities. According to the general causes of teratogenesis, any abnormal disturbing force may interfere with the proper developmental growth of the embryo.

REPORT OF A CASE OF HYPEREMESIS GRAVIDARUM WITH NECROPSY

By M. T. HARRISON, M.D., ATLANTA, GA.

ON DECEMBER 5, 1930 I was called to see a colored woman aged twenty-six, who previous to her marriage two years before was a graduate nurse. Her appendix was removed in 1924; tonsils in 1927; and on July 4, 1930 when six weeks pregnant, an abortion was induced because of uncontrollable vomiting.

Following the abortion on July 4 she menstruated once. She missed her monthly period expected early in September and during the last week in September became nauseated. She called her family physician who diagnosed the condition as the nausea of pregnancy. She did not respond to his treatment and on November 19 was transferred to an Atlanta hospital.



Fig. 1



Fig. 2

Fig. 1.—Heart, showing cloudy swelling of fibers, fragmentation, nuclei obscured, and edema. (High power.)

Fig. 2.—Kidney, showing marked degenerative changes in the tubules. The normal histologic cells are degenerated. Only the structural tissues remain. There is also some cloudy swelling. (High power.)

She was placed on limited fluid intake, alkalies, and a carminative prescription by mouth. Glucose 2 per cent in normal saline was administered daily by rectum. Her room was quiet, visitors were restricted and she was given mild sedatives with an occasional small dose of morphine and scopolamine. The first week she vomited almost every liquid taken by mouth. On the twenty-sixth she vomited very little and apparently enjoyed what nourishment she was given. Until December 4 there seemed to be slight daily improvement. On the morning of this day the nurse detected a rapid pulse and made the following notation on the chart "patient acts queerly at times." Her physician was notified. He ordered 1 c.c. of digifoline every four hours and four grains of calomel. Normal saline was given under the skin and by rectum.

Her temperature had ranged from 97° to 99.8° F. with an average close to normal. Her pulse had varied from 88 to 122 with an average between 90 and 100.

The most notable observation was obstinate constipation. In fact not one entirely satisfactory bowel movement was recorded.

Examination on December 5 at 1:30 A.M. disclosed an emaciated colored woman who answered questions rather slowly and who seemed more or less dazed. The skin was dry and the feet cold. Her blood pressure was 100/88; temperature 97.8°; pulse 140 and respirations 26. The lips were dry and fissured. There was no glandular enlargement in the neck. The lungs were clear and other than a rapid rate the heart appeared normal. The abdomen was distended. The percussion note was tympanitic. Above the symphysis could be felt the upper border of an oval mass. The cervix was soft and deep in the pelvis. The uterus was outlined above the cervix and was approximately 15 cm. in diameter.

The clinical diagnosis was hyperemesis gravidarum, with a very discouraging

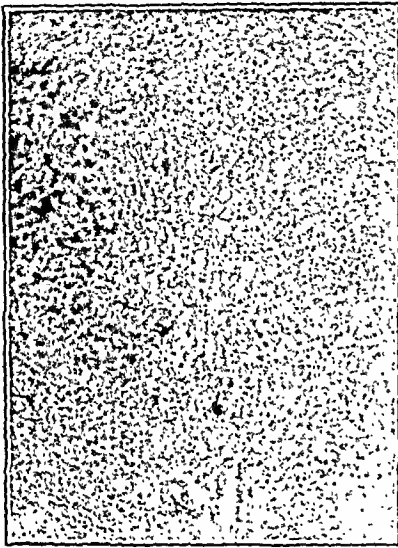


Fig. 3



Fig. 4

Fig. 3.—Liver, showing areas of marked fatty degeneration and infiltration. (Low power.) (These areas are numerous throughout organ.)

Fig. 4.—Liver, showing fatty change. (High power.)

outlook. Intensive supportive measures were instituted. For about twelve hours there was some improvement after which she began to decline and died about twenty-four hours later. Three hours after death a necropsy was performed by Dr. J. C. Norris whose report follows:

The heart was not enlarged. The right side was soft and dilated. The liver was normal in size but was pale and flabby. The cut surface had a greasy appearance. The spleen was soft and was slightly enlarged. The kidneys were swollen and showed cortical petechiae. There was a moderate nephritis. The uterus was soft, 16 cm. in diameter and contained a four months' fetus. The placenta overlies the internal os.

The anatomic diagnoses were: (1) Generalized toxemia: (a) Toxice myocarditis with dilatation, (b) congestive pneumonitis, (c) toxic hepatitis, (d) toxic splenitis, (e) toxic nephritis. (2) Dehydration, (3) anemia, (4) pregnancy at four months with placenta previa.

Blood chemistry: Sugar 60 mg. per 100 c.c. Nonprotein nitrogen 100 mg. per 100 c.c. The histologic diagnoses are: Congestion of pulmonary alveoli, edema; cloudy swelling of heart cells; fatty degeneration and infiltration of liver, with cloudy swelling of kidneys, marked in the tubules. The glomeruli are hypertrophied. The vessels are empty.

1111 MEDICAL ARTS BUILDING.

A COMPARATIVE STUDY OF MERCUROCHROME AND HEXYLRESORCINOL AS ANTISEPTICS DURING LABOR*

BY HAROLD B. HENDERSON, M.D., DENVER, COLO.

(From the Department of Obstetrics and Gynecology, University of Colorado School of Medicine and Hospitals)

THIS study is an extension of a previous report of "Mercurochrome as an Antiseptic During Labor," published in *Colorado Medicine*, June, 1930. At that time 200 cases were reported: 100 in which mercurochrome was used as an antiseptic during labor, and 100 cases of controls in order to obtain the comparative percentage of lowered morbidity and possibly mortality.

To this series are now added 300 more cases: 100 each in which mercurochrome and hexylresoreinol respectively, were used as antiseptics during labor, and 100 more control cases.

The standard of morbidity varies in the different clinics, and the percentage varies accordingly. Any patient whose temperature reaches 100.4° F. on two successive days following delivery, not including the day of delivery, and occurring not later than the tenth day, we have considered a "morbidity." This is the standard accepted by the Johns Hopkins Hospital. This is practically the same standard as that of the American College of Surgeons. The University of Michigan considers as morbid all cases showing a temperature of 100.4° F. at any time from delivery to discharge, temperatures being taken every four hours. Goodall and Wiseman prefer to consider as morbid all cases in which the temperature exceeds 99° F. on any three consecutive days, exclusive of the first twenty-four hours; and in addition, all cases that are morbid but afebrile, such as subinvolutions and thrombophlebitis.

Mayes reports results with the employment of mercurochrome in over 10,000 consecutive cases which showed a lessened morbidity of more than 50 per cent. He also claims that it is a valuable procedure before cesarean section, induction of labor, and vaginal examinations.

Our technic was that of Mayes without quite as an extensive spraying of the thighs. The maternal morbidity of 200 consecutive cases in which mercurochrome was not used was 52.25 per cent higher than the maternal morbidity in 200 consecutive cases in which mercurochrome was used, and 37.50 per cent higher than in the series of 100 cases in which hexylresoreinol was used as an antiseptic during labor.

The hexylresoreinol was used in this small comparative series because of both its colorless and nonirritating nature, and although the results are not definitely conclusive, they compare very favorably with the larger mercurochrome series.

*I am indebted to Dr. W. H. Mast, Resident Physician at the Colorado General Hospital where this series was observed, for his help in reviewing these cases.

In view of the fact that our figures fairly well corroborate those of Mayes in respect to mercurochrome and our own observations with hexylresorcinol, we desire to report them with some little enthusiasm, and because of a certain added sense of security which the procedure of the use of antiseptics during labor gives to the mind of the obstetrician, especially in those more critical and difficult situations.

509 REPUBLIC BUILDING.

REPORT OF TWO CASES OF RUPTURED LIVER IN THE NEWBORN

By H. J. RUSSELL McNITT, B.S., M.D., WASHINGTON, D. C.

RUPTURE of the liver in the newborn seldom has been described in literature. The usual history of the case is found in an apparently normal child, who within three or four days of birth, suddenly becomes ill and dies rapidly within a few hours.

Hepatic injury is the most common of intraabdominal traumatisms, but actual rupture of the liver is the least common of all the various forms of injury. Death in actual rupture is postponed as a rule for three or four days, during which time a subcapsular hemorrhage is slowly taking form. When the pressure of the blood within reaches the proper proportions, a rapidly fatal intraabdominal hemorrhage results.

The usual cause of this condition is pressure or torsion of the fetal abdomen. Usually there is a history of definite external trauma to be found, although there has been reported a case in which the birth was spontaneous, rapid, and not attended by any external manipulation before birth or immediately afterward.

CASE 1.—Mrs. E. M., aged twenty-nine years, married. Three full-term labors with two forceps deliveries.

History of present pregnancy: The last menstrual period was on March 10, 1930. The prenatal physical examination was essentially negative, except for some dental caries. Her measurements were normal and the coccyx was movable. The patient's height was 61¾ inches, and she weighed 110 pounds.

The blood pressure during her prenatal period varied from 96/60 to 120/80. At no period did she have any edema of the feet or bleeding from the vagina. Toxic symptoms were never present, and except for an occasional attack of constipation, her bowels were always free. Active fetal movements were felt during the fourth month.

On the sixteenth of December, one day before the estimated date of confinement, the patient went into labor. At this time the position was R. O. P., and the fetal heart strong. After six hours of hard labor with the cervix practically dilated, the position was still R. O. P. The abdomen was manipulated between pains with the end in view of turning the fetus, this was accomplished quite easily, and about twenty minutes later a baby boy, weighing 8 pounds was born.

The child took the breast well and appeared perfectly normal. Two days later, the baby suddenly vomited, its respiration became more rapid, and its skin very anemic in appearance. One hour later it died. Artificial respiration failed, as did intracardiac injections of adrenalin.

The autopsy findings were as follows: On opening the abdomen, many large clots of blood were seen. These were readily washed out with running water, but on examining the upper abdomen, a large clot was seen to be more firmly attached to the under surface of the liver. On close examination, a rent in Glissons capsule, approximately one inch in length was found, and beneath this, a corresponding laceration of the liver substance. This tear extended from a point on the inferior surface of the right lobe near the vertebrae, laterally, and forward for the distance of one inch. A clot was firmly attached to the bed of the laceration. All organs were anemic in appearance. The tentorium cerebelli showed no laceration or hemorrhage.

CASE 2.—Mrs. D. P., aged twenty-three years, white. Previous pregnancies: twins, died when three days old, cause unknown, no autopsy. Last menstrual period, January 19, 1930. Quickening at four and one-half months. During the eighth month there was some slight bleeding with no pain. Subsided after one week in bed. No return. Urine negative. On October 31, 1930, the patient went into labor at 4:30 A.M., the membranes ruptured at 4:00 A.M. and birth of a male infant weighing 9 pounds 3 ounces took place at 7:35 P.M. on the same day. The position was L.O.A. Ether anesthesia was used and there was a loop of cord around the infant's neck. Three days later, on the third of November at 4:30 P.M. the baby apparently became very hungry (thirsty?), regurgitated, grew pale, defied all attempts at resuscitation, and died at 12:30 A.M. The child's temperature ranged from 99° to 101.8°.

At the end of the second stage of labor, mild pressure was exerted on the abdomen during pains in order to assist the slow descent of the large child through the birth canal. This was the only antepartum manipulation made.

Autopsy Report: Intraabdominal hemorrhage of dark thick blood. A large clot was found toward the posterior inferior aspect of the right lobe beneath the capsule of Glisson, filling the proximal portion of the right lateral gutter. Dissecting up the capsule of Glisson, almost over the entire postinferior aspect of the right lobe, the subcapsular hemorrhage measured 2½ inches by 1½ inches. On removal of the liver, a more or less elliptical slit or rupture was noted in the capsule extending toward the lateral aspect of liver margin.

I present these two cases merely to show the possible sequelae of antepartum manipulations, even though they may be of quite gentle nature. I feel that a certain percentage of deaths occurring in this period of three to four days following delivery would fall in this group of liver injuries if more autopsies were done on these babies.

I am indebted to Dr. Chester Brady, of this city, for the second case report.
1835 EYE STREET, N. W.

REPORT OF A CASE OF ACUTE APPENDICITIS COMPLICATING LABOR WITH PREECLAMPTIC TOXEMIA

By BEN-HENRY ROSE, M.D., NEW YORK CITY

DE., aged nineteen, female, white, married. Last period March 22, 1929; date of expected labor, December 27, 1929.

Patient came to see me at 9 A.M. on December 11, 1929, with the history that she was awakened with a severe attack of pain in the right upper quadrant about 4 A.M., with vomiting of bile, pain persisting without relief. She had had a natural bowel movement. She had not been to see her physician for the past three months. In fact, she worked as a salesgirl in a department store until the day previous, wearing a tight corset!

The patient had blood pressure of 158/100, and examination showed a full-term gravidity. There was some tenderness over the region of the gall bladder, none on palpation over the other quadrants of the abdomen, some tenderness of percussion over the costovertebral angle. Both legs were edematous. Rectal examination did not reveal any cervical dilatation. Urine showed albumin (+++), granular and hyaline casts, some blood but no pus cells. A diagnosis of preeclamptic toxemia was made and the patient was advised as to the diet and hygiene. She returned at 7 P.M. on the same day, not having had any opportunity to follow the prescribed instructions, complaining of severe and agonizing persistent pain in the right lower quadrant of the abdomen. She had vomited several times during the day. The pain was so severe and agonizing that she could not sit quietly for even a few minutes. Physical examination revealed marked tenderness on palpation over the right lower quadrant of the abdomen with definite rebound tenderness present. Pain was increased on elevation of the thigh on the abdomen. There was spasm of the right rectus muscle. There was tenderness on percussion over the right costovertebral angle. Rectal examination revealed that the cervical os was 3 fingers dilated. The rectal temperature was 99.8°, pulse 90, respirations 20. Blood count: Total white blood cells 15,800. Polymorphonuclear leucocytes 82 per cent, basophiles 1 per cent, lymphocytes 17 per cent.

The patient was seen again three hours later. The pain still persisting in the right lower quadrant without radiation, and the rectal examination revealing a cervical dilatation of 4½ fingers, she was sent to the hospital. As the patient was being prepared, the membranes ruptured and caput appeared. Because of the persistence and localization of the pain to the right lower quadrant, because of the blood count and the absence of pus cells, a diagnosis of acute appendicitis complicating labor was made, and it was decided to open the abdomen directly after the fetus was born; under gas oxygen analgesia, a living male fetus was delivered. The afterbirth was delivered, no pituitrin or ergot was given, and the anesthesia continued.

Operation: McBurney intermuscular incision, peritoneum opened, free sero-sanguineous fluid escaped, a large markedly congested appendix, covered with some plastic exudate, distended at the tip, was found and removed between clamps. The stump was ligated, phenolized and alcoholized, and tied to the stump of the meso-appendix. The abdomen was closed in layers, no drainage.

The patient made an uneventful recovery; the lochia was normal; and there was no marked postoperative distress aside from that which normally follows an appendectomy. The wound was healed by primary union, and the mother and child were discharged on the eighteenth day.

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229 EAST KINGSBRIDGE ROAD.

CHINESE CUSTOMS AND TRADITIONS OF CHILDBIRTH WITH BIRTH STATISTICS FOR SAN FRANCISCO*

BY JOSEPH SHIANG-MIN LEE,† M.D., SAN FRANCISCO, CALIF.

THIS paper records some of the customs and folklore of Chinese women in pregnancy and labor, few of which longer obtain among the Chinese resident in San Francisco. In fact, hardly any of them are accurately known to the younger women here, who are mostly now of the third or second generation of Chinese women born in San Francisco.

The old traditions gradually fell into disuse for a number of reasons. Contact with Americans, observations of their customs and laws, the influence of the public schools, the immigration laws and the recognized need for proper registration of births and deaths have changed the conditions. The first generations here utilized the older women relatives as midwives; those who came later employed women physicians. At the present time, no licensed Chinese midwife is practicing among the Chinese in San Francisco. Last year every birth in the Chinese quarters was reported by physicians. Even to the older generation, the customs of older China here described remain but a hazy memory.

In fact, it was not easy to obtain the data for this paper. The male Chinese physicians have never had obstetric practice. In older times they were never called into consultation by the amateur midwives except in case of desperate emergency. Often they were sought only for medicine. This older generation has passed away. This data were obtained from such old women as had in the past officiated as midwives during the confinement of their daughters-in-law, relatives and

*Contributed to the White House Conference, as a part of the report of the Subcommittee on Factors and Causes of Fetal, Early Infant, and Maternal Morbidity and Mortality—Hugo Ehrenfest, M.D., Chairman.

†Assistant in Medicine, University of California Medical School.

friends as in old China. There each locality had its own practices and customs, considerably modified by the religious and ancestor-worship customs of each individual community.

There is evidence to believe that Chinese women rarely have serious difficulty in labor. Childbirth with them is relatively easy. The lying-in period is very short. Their labors support the view that women who live simpler lives have easier labors than their more luxurious living sisters and that women from villages and small towns are less likely to have dystocia than those who live in the cities.

The older generations had comparatively few rules to guide the pregnant woman. She continued to do her housework or other daily occupation. She was advised to be moderately active up to the day of labor.

There was comparatively little restriction of diet: only a few generally recognized principles of eating. Crabs and shrimps were not eaten because it was known that they might cause urticaria. Lamb and mutton were avoided since it was thought that they might cause the child to have epilepsy. Whether there is or is not basis for this belief may not be known, yet the word "YEUNG" meaning lamb is compounded in the Chinese expression for epileptic fits. On the whole, a diet of easily digested simply cooked foods was taken.

The mother-in-law or midwife was called into attendance at the time of childbirth. There was no preparation for the labor; very little was done to prepare the mother. Nature was allowed to take its course; patient waiting was the rule. The child was allowed to be born without assistance, if possible. No examination was made to determine the presenting part either during pregnancy or labor. Any deviation from the normal labor was ascribed to some disease of the mother, some condition of her blood, poor health, bad temper, or the machinations or bad influence of the devil.

When the patient came into definite labor, she assumed a squatting position, either on the bed or on a low stool. This seems most natural since it calls to the patient's aid the help of the force of gravity. During the minutes of severe pains, the midwife and friends gave such physical assistance as they could offer by pulling against her arms, and talked to her attempting to encourage her. Medicines were used if there was any difficulty in delivery. They were mainly concoctions of herbs, taken by mouth to stimulate the muscles and abolish fatigue. But if the medicines did not help her, there was little hope either for the mother or the child. On the rare occasions of malpositions, the more brave midwife might attempt version, done without any scientific knowledge. Yet, if these attempts failed, a hopeless outcome was inevitable.

After the child was born, the delivery of the placenta was also left to nature, although the abdomen was often massaged to help matters

along. If the placenta was retained, the midwife would pull on the umbilical cord. Rarely was manual removal attempted. The umbilical cord was tied with ordinary sewing thread about three or four inches from the child's abdomen. This length was believed to be important if one would prevent the child from having abdominal colic. Without any attempt for asepsis or sterilization, the cord was severed with the sharp edge of a piece of broken bowl or knife. The placenta was usually destroyed by fire. It was, however, considered an excellent remedy for tuberculosis when cooked with certain remedial herbs. But, as bad luck was supposed to follow the child if the placenta was thus used, this preparation constituted a very rare medication.

Uterine hemorrhage was treated first by massage of the abdomen; then medicines were given prescribed by a physician. If the lochia suddenly stopped, medicines were asked of the physician and the patient was given pig's feet cooked with ginger as diet. Puerperal fever of any type was treated by cathartics; but when it became serious, it was a case for a physician.

Both mother and child were bathed after the labor with water in which ginger or the skin of Chinese grapefruit had been boiled. This was supposed to rid both mother and child of gas in the gastrointestinal tract. If there was an idol in the house, the water was placed before it for a blessing before it was used. Such a bath probably acts like a mild mustard bath would.

The mother's first meal was a bowl of rice fried with ginger in order to help her get rid of the toxic products accumulated both during pregnancy and during labor. The regular diet during the first month did not contain vegetables since these were thought to cause diarrhea in both the mother and the child. This was probably a survival of the custom in China where the soil in which vegetables are grown is most unsanitary. Vegetables were not provided because they were not recognized as necessary for a balanced diet. Salt fish, pork, chicken and duck were permitted. On the third day, the mother was given chicken cooked with the inevitable ginger to act as a carminative, to stimulate the digestive functions, and to increase the flow of milk. From the tenth day on, pig's feet cooked in black vinegar and raw ginger, without water were eaten for the same effects, also because they were less costly than chicken. After the first month, the mother was considered sufficiently recovered from the effects of labor and puerperium so that she could resume a regular diet, including vegetables.

Women from the southern parts of China favor foods which contain ginger and vinegar in combination; those from the north avoid them, and in their place use sugar in the mother's diet. The southerners avoid sugar and use ginger-vinegar combinations to stimulate the

gastrointestinal tract and promote a better food assimilation. The northerners use sugar probably to add calories without much bulk to the diet. The selection of foods depends upon the customs prevailing in various parts of the country. This is merely a matter of common usage.

No special attention is paid to the woman during her puerperium. The poorer mother is compelled to return to her household duties as soon as possible. So a multipara may be up and about an hour or two after the delivery, although usually she is in bed between three and five days. The better classes can afford to let the mother take life more easily for a month. In any case, the mother cannot properly leave her house until a month after labor and the ceremonies for the baby have been celebrated. A "lucky day" is chosen, the baby is brought forth for a bath, his head is shaved, his ancestors are worshiped and then he is considered one year of age. Following this, there is a celebration and a banquet when chicken and red colored eggs are distributed to relatives and friends. After this, and not until then, the mother returns to her normal everyday social life.

That Chinese methods of life in San Francisco do not affect unfavorably the maternal or fetal mortality may be seen from the following figures taken from the San Francisco Board of Health records:

From January 1, 1929, to October 1, 1930, 649 Chinese women were delivered with three maternal deaths (0.47 per cent) and 13 stillbirths (2.0 per cent). Two of the women died in eclampsia and the other death was ascribed to embolism. One hundred eleven of the women were primiparous and 538 were multiparae. Of the 362 children born in 1929, 186 were males, and 176 females. There were two sets of twins in this series.

Of the 649 women delivered in 1929 and in 1930 up to October, 122 were delivered in the Chinese Hospital with one maternal death (eclampsia) and four children stillborn, one of which was from craniotomy. The children in this series of 122 cases averaged 3,192 gm. in weight, the smallest being 1,927 gm. in weight and the largest child being 3,884 gm.

During the same period of time, January 1, 1929, to October 1, 1930, there were 38 deaths of children under one year of age of which 8 were due to prematurity, 2 were charged to congenital heart disease, and 2 to congenital debility. Thirteen died from pneumonia, 3 from tuberculosis, and 1 each from enteritis, convulsions, diphtheria, measles, whooping cough, etc., none of which could be charged to the labor.

The Chinese Hospital was opened on April 20, 1925, and until October 30, 1930, has had 230 deliveries. The records do not always record the position in the spontaneous normal deliveries, yet there are records of 9 breech, one face, and one transverse presentation. Two

placenta previas are recorded and one eclampsia. Operative interference was necessary 21 times (8.8 per cent), there being 16 low and midforceps, 2 high forceps, and 3 cesarean sections, without maternal death. The single maternal death was due to eclampsia (not delivered).

Thus one may see that the Chinese in San Francisco are delivered with a maternal and fetal mortality that is not unfavorable to them when compared with other quarters of the city. That this creditable showing depends in large part upon the fact that physicians alone superintend the deliveries is evident. Improvement in mortalities will follow more adequate prenatal care which now is limited, not because of racial customs and traditions but because of the expense at present attached thereto.

Bland, Goldstein, and First: The "Physiological" Anemia of Pregnancy. Surg. Gynec. Obst. 50: 954, 1930.

Of the 1000 patients examined in various periods of gestation, 47.4 per cent gave evidence of an anemia, with red cell counts of 3.5 million or less.

A distinct hemoglobinemia of 70 per cent or less occurred in 58.6 per cent of the gravidæ. Only 24.7 per cent of the patients examined in the first two trimesters showed a moderate to a severe anemia, in contrast to 56.7 per cent of the patients examined in the third trimester. Although the latter group constitutes a much larger number of patients, anemia is as a rule, more marked with the advance of pregnancy. Of a group of 35 patients with a definite anemia in the early months of gestation, 26 showed improvement at term.

Of 106 patients with a moderate to a severe anemia, 58.4 per cent began to show improvement within one to two days after childbirth. Of 94 patients with a mild anemia or a normal count during pregnancy, 73.4 per cent showed the effect of labor by a further reduction of the red cell count within twenty-four to forty-eight hours.

A marked improvement ensued within seven to ten days after labor, occurring in approximately 72.6 per cent of the 106 patients anemic during pregnancy.

The most interesting feature disclosed by this study was the remarkable recovery developing within two to six months after delivery. A distinct improvement in the red cell count took place in 92 per cent of the 100 patients examined. In 95 per cent there was also a marked improvement in the hemoglobinemia.

WM. C. HENSKE.

Society Transactions

NEW YORK OBSTETRICAL SOCIETY

MEETING OF MAY 12, 1931

DR. G. H. RYDER presented the following instruments: (1) **A Uterine Packer for Cesarean Sections**; (2) **An Umbilical Cord Clamp**.

The uterine-packer guide for cesarean section cases is an adaptation of an old instrument. This instrument is straight and four inches long, with a rounded knob at one end, and teeth with a sliding ring at the other. The teeth are caught in the gauze packing and fixed by the sliding ring. After the baby and the placenta are born, the opening in the cervix is located by the finger from above, and the packer guide is pushed through the cervix into the vagina. The uterine cavity is then easily packed. (Fig. 1.)

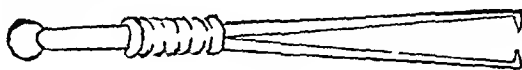


Fig. 1

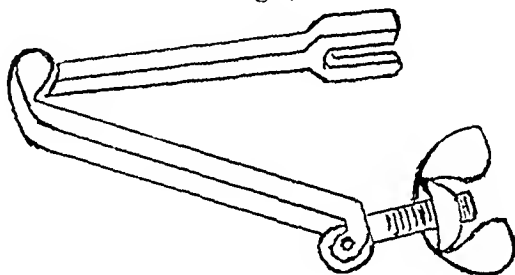


Fig. 2

At any time after the completion of the operation, the packer-guide may be located in the vagina and removed with the attached gauze, or this may be pulled down within reach, and the packer-guide removed alone.

The umbilical cord clamp is made of bronze and nickel plated, it is in two parts joined at one end by a hinge. At the other end the lower part has a swivel thread and turn screw designed to fit into the forked end of the upper part. The cord is clamped with two long clamps and cut between. The baby is then removed, with one long clamp attached to a table, covered with a sterile sheet, and the umbilical cord clamp is adjusted on the cord, between the long clamp and the baby's navel. It is screwed down tight and the cord is cut through close on the distal side. The dressings are then applied around and over the clamp. The clamp may be removed at any time after five to eight hours, or it may be left on until the cord drops off. (Fig. 2.)

DR. HOWARD C. TAYLOR, JR., by invitation, read a paper entitled **Endometrial Hyperplasia and Carcinoma of the Body of the Uterus**. (For original article see page 309.)

DISCUSSION

DR. R. T. FRANK.—The uterine mucosa is constantly undergoing changes; cyclical mitoses are frequent, more so probably than in any other tissue in the

female except the breast. The reason, in my opinion, that breast carcinoma is so much more frequent in the female than in the male is because in the breast of the woman the same areas of tissue are undergoing these cyclical changes over a long period of years. In the uterine mucosa, on the other hand, in the majority of instances with every monthly cycle a large part of the mucosa is cast off, and, consequently, the stimulus is undergone at the next cycle by fresh areas of tissue. This, I think, saves the female from a greater incidence of adenocarcinoma of the fundus than would otherwise occur. Furthermore, I can add some physiologic evidence to prove that hyperplasia probably has a direct connection. I am not speaking now in the morphologic sense in which the practical pathologist is frequently forced to make a diagnosis between suspect tissues and carcinoma tissues, because I am a firm believer in Lubarsch's dictum that a given tissue is either carcinoma or is not. That does not signify that in a given instance we are justified in drawing conclusions from the picture under the microscope, or that we can invariably determine that this is malignancy or not; if the material is inconclusive sometimes time alone will show. Conclusive evidence that hyperplasia may be at fault is supplied by the fact that in a number of women long past the menopause, in whom carcinoma is found or suspected, to our great surprise (the number is still small because this was first an accidental find which we really are at present trying to confirm numerically without our opinion being definitely formed) the hormone content of the blood was found exactly as we find it in young menstruating women. This is an entirely anomalous finding and would, therefore, give confirmatory evidence to the fact that hyperplastic tissue in these old women is probably the basis of malignancy because as age advances irritated or activated tissues are much more prone to cancer symptoms or cancer change, whatever that may be.

DR. S. H. GEIST.—I was interested in the statement that there is a definite relationship between hyperplasia of the mucosa and the appearance of adenocarcinoma. We know that in hyperplasia of the intestinal mucosa, the so-called polyposis of the intestine, carcinoma is a very common sequel. However, it is to be remembered that the hyperplasia of the uterine mucosa is a very common lesion associated with many diseases of women and it is only natural that one would expect to find that a certain number of these women subsequently develop carcinoma. A curettage performed some years previously for conditions accompanied by hyperplasia of the endometrium might well have been done in a case that develops carcinoma subsequently without any definite relationship to the hyperplasia. Nevertheless the number of cases Dr. Taylor presented is somewhat significant, but I think in point of view of the frequency of the antecedent benign condition one must suspect that the malignancy may to a certain extent be coincidental.

The hormone finding of Dr. Frank in women past the menopause is significant, for in a study of postmenopausal bleeding in 180 cases, we found 8 per cent of women from one to more years past the menopause, there was a definite hyperplastic endometrium present.

DR. B. P. WATSON.—It is very essential in the training of any gynecologist or any surgeon, that he should study thoroughly the pathology of the various lesions.

I was going to make the same point that Dr. Geist made with reference to the frequency of hyperplasia and the difficulty of stating that because the woman had hyperplasia some years before and subsequently developed carcinoma, the one was necessarily the direct result of the other. We are coming to recognize that a very large number of women who suffer from menorrhagia have this cystic glandular hyperplasia.

The other point I should like to mention is in reference to some of those sections in older women where there was a carcinoma alongside an area, or in an area of mucous membrane where there were numbers of dilated glands. Now, that also

is a fairly frequent finding in older women. I wonder if Dr. Taylor were to take a series of sections from the uteri of women of similar age that he would not find just as many dilated glands in those where there was no carcinoma at all.

DR. J. A. CORSCADEN.—I regard the method of working back from carcinoma to the hyperplastic endometrium as extremely important. I think the other method of working from endometrial hyperplasia toward the carcinoma may perhaps also have some value. I have just completed a study of some 500 women who received an artificial menopause for fibroids and for bleeding. About half of them had hyperplasia. Out of the 500 there were two adenocarcinomas of the body. In one of them there was an atrophic endometrium found seven years before the carcinoma appeared, and in the other a polyp. She, by the way, had a second curettage in which a second polyp was removed. This follow-up period was from one and a half to seventeen years, averaging seven and a half years. If they had only been curetted, probably the findings would have helped more. Unfortunately, they all had sterilizing doses of radium, anywhere from 1,200 to 1,800 mg. hr., so that it is perfectly possible that the infant carcinoma was destroyed by this small dose of radium, but it is a significant fact that the two women who developed carcinoma of the body, one four years and one seven years afterward, did not have endometrial hyperplasia, except in one case where it was localized in an endometrial polyp.

DR. TAYLOR (closing).—I personally regard "precancerous" as a very useful term. It need not mean that cancer will certainly develop but indicates that the tissue is close to cancer in form. Subcancerous would perhaps be a better term. In any case some such word is of practical value to the pathologist who wishes to imply to the clinician that the case is one which deserves special consideration.

I was hesitant about making a definite statement in regard to the women over sixty years of age because hyperplasia has been regarded as a condition of earlier life.

In reference to the commonness of hyperplasia I am quite ready to admit that probably all women have minute areas of hyperplasia some time in their lives, just as they all have areas of chronic mastitis. The cases mentioned have, however, been those with symptoms of hyperplasia, and as such I believe they may be representative of cases in which the hyperplasia is particularly widespread. Of course I am quite willing to concede that any real statistical proof of a relation of hyperplasia to carcinoma is impossible.

Dr. Watson's statement about the glands being merely cystic and not hyperplastic is, I feel, a logical criticism. It was my impression, however, based upon my conception of the disease and of the tissue in the slides, that these glands were not merely dilated but were also hypertrophied.

Dr. Corscaden mentioned one case in which there was a polyp. I omitted any reference to polyps in the reading of this paper although I have studied over 50 cases. Reference in the published paper is to be made to several reported instances of the development of carcinoma from polyps, an occurrence having some bearing on the subject since many polyps are essentially localized areas of hyperplasia.

DR. C. H. PECKHAM, of Baltimore, Md., presented (by invitation) a paper entitled **Chronic Nephritis Following Apparent Toxemia of Pregnancy**. (For original article see page 386.)

DISCUSSION

DR. E. E. BUNZEL.—I want to agree with Dr. Peckham in the difficulty in classifying these patients so far as the type of toxemia that they have is concerned. I think it is inadequate in many instances to try to classify them as mild, moderate

or severe. All we can really say is that they have toxemia or that they have convulsions with toxemia. We followed a series of cases for a period, examining them anywhere between ten and twenty-two months after they had been delivered, and in this toxic follow-up clinic we found figures very similar to those quoted by Dr. Peckham. We found in 37.6 per cent of our patients a blood pressure of 140 or over. We found 39.8 per cent of our patients had albuminuria. In doing an intravenous phenolphthalein test we found 54.2 per cent excreted less than 50 per cent of the dye. Of the cases which had eyeground changes, that is, papillary edema, retinitis or hemorrhages, 31 per cent showed persistent retinal changes.

We also followed these patients from the point of view of what happened to them in subsequent pregnancies and our conclusion was that if there had been a toxemia, mild, moderate or severe, or with eclampsia, they would have a 69 per cent chance, taking them all as one group, of a recurrence in a subsequent pregnancy; and with this recurrence they had only a 60 per cent chance of having a live child.

DR. A. W. BINGHAM.—I should like to ask in these cases which were toxic on the previous occasions what treatment was given to prevent their becoming toxic in the next pregnancy. I believe there is a relationship between a gain in weight and toxemia of pregnancy. I noticed that the weight was not given in any of these cases. I have found that if the patient gains over twenty pounds she is five times more likely to become toxic than a patient who has not gained twenty pounds.

DR. C. H. PECKHAM.—We are dealing with at least 50 per cent colored clinic material and our average patient we cannot persuade to come to us until seven or eight months, and they very much prefer to wait until they go into labor, and despite all our social service department has been able to do, we still have great difficulty in getting any patients to come in early in pregnancy.

In regard to the question of subsequent pregnancies, we have another series of eclamptic women in whom over 50 per cent in a pregnancy following the eclampsia showed some signs of a toxic process.

PROF. E. C. DODDS, of London, England, presented (by invitation) a paper entitled **Biochemical Investigations in Obstetrics.**

BROOKLYN GYNECOLOGICAL SOCIETY

STATED MEETING, APRIL 3, 1931

DR. CHARLES W. MUELLER (by invitation) reported **A Case of Fibroid Complicating Pregnancy.**

This case is presented, not as a rarity, but to show the rapidity with which such tumors may grow and the rather unusual size that this tumor presented at subsequent operation.

J. S., aged twenty-four, presented herself at the hospital for the first time, via ambulance, having been transferred from a small sanatorium of this city. A primipara, at term, with ruptured membranes, in labor, having regular uterine contractions every fifteen minutes of forty-five seconds' duration. The membranes had ruptured the morning of admission with the onset of labor. She was admitted to the sanatorium where in the interval of several hours at least two vaginal examinations were done, and when it was found that a tumor complicated her pregnancy, she was transferred to the wards of Kings County Hospital, on the service of Dr. Dunne.

A brief history revealed a negative antepartum course as far as could be determined. There were no miscarriages, abortions or abnormalities of menses. Her past and surgical histories were negative. Physical examination revealed a patient in active labor with a normal temperature, pulse of 82, blood pressure 130/85. The abdomen was the size of a full-term pregnancy, the fundus of the uterus three fingers' width below the ensiform, lower pole head, floating at the brim. Back to the left, small parts to the right, upper pole breech. The fetal heart was heard in the lower left quadrant, rate 160, quality good.

Vaginal examination revealed a nulliparous outlet, edematous with a recent laceration of the perineum repaired with two chromic sutures. Slight bloody discharge. The cervix was soft, fairly well thinned out, and dilated three and a half cm. The membranes had ruptured. Posterior to the cervix, the finger encountered

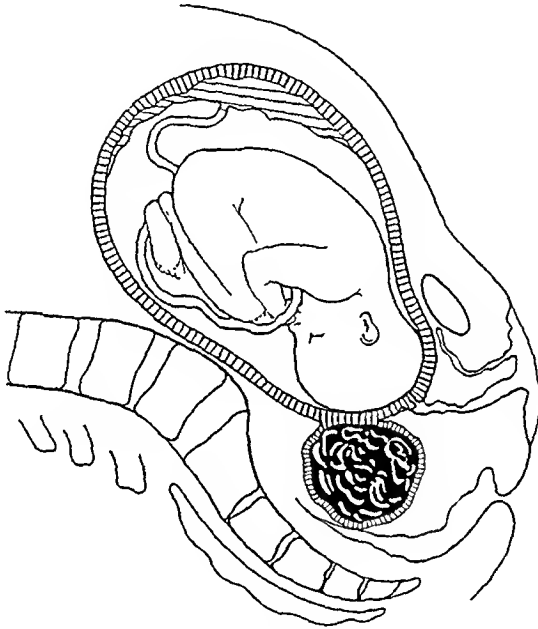


Fig. 1

a hard, firm, fixed, nontender mass, four and a half inches in diameter, which obstructed the descent of the head. The head was the presenting pole of the fetus which dipped into the inlet of the pelvis, but was not engaged. The symphysis was of normal width and thickness, the arch was ample as was the transverse diameter of the outlet. Four per cent mercurochrome was instilled into the vagina. The diagnosis was pregnancy at term, with fibromyoma of the uterus, occupying the hollow of the sacrum and thus preventing the head from descending in the normal manner.

The blood count showed red blood cells 3,168,000; hemoglobin 78 per cent; white blood cells 25,400, with 86 per cent polymorphonuclears.

The x-ray examination showed pregnancy at term, cephalic presentation, occiput being directed to the left and anteriorly, but relatively high in the pelvis.

A cesarean section was done of the usual low cervical cross-flap type. The mass described in the vaginal examination was found to be a fibromyoma four inches in diameter, intramural, arising from the lower posterior segment of the uterus, but it was deemed inadvisable to remove either the tumor or the uterus at this time because of the loss of blood, the added surgical shock, the risk of infection because of the previous manipulations prior to her admission to our institution.

The child weighed seven and a half pounds and was resuscitated easily. There was a spina bifida in the lower lumbar region.

The postoperative course was uneventful except for a slight superficial skin infection.

From her discharge on March 2, 1928 until March 14, 1930, two years later, no contact could be made with this patient. At this time, she was admitted to St. John's Hospital with the chief complaint of progressive enlargement of the abdomen, pain while standing and walking. The patient noticed that, following the cesarean section, her abdomen steadily increased in size but except for disfigurement and a slight discomfort, it caused her little or no trouble, and rather than subject herself to operation, she waited until the present time. During the past six to eight months, she had noticed a frequency of urination without pain or burning; also had suffered considerable pain which she described as in her pelvis, such as a bearing-down feeling while standing or walking. Bowels were regular. There had been no



Fig. 2

change in her menses, the same as before her cesarean and previous to the enlargement of her abdomen.

The physical examination showed a stout female adult, aged twenty-five, not apparently ill. Pulse rate 80 and strong. Blood pressure 125/82. Abdomen larger than the size of a full-term pregnancy, smooth in outline. There was a large, hard, firm, nontender tumor mass, filling the abdomen to within three fingers' width of the ensiform. It was not freely moveable, but none of the physical signs of abdominal fluid could be determined.

Vaginal examination showed the external genitalia normal. The examining finger could only enter the vault of the vagina for a distance of one inch, when it encountered a hard, large, firm, nontender mass which occupied the entire pelvis, pushing a very small cervix well forward just behind the symphysis. Nothing else could be determined.

The laboratory findings were: Red blood cells, 4,720,000, hemoglobin 80 per cent, white blood cells 8,650, polymorphonuclears 60 per cent. No change in morphology. The bleeding time was two minutes. Coagulation time was six and a half minutes. Sedimentation time was eighty minutes. Blood chemistry showed sugar 100, urea 30, creatinine 1.2.

The patient came to operation several days after admission. A mid-line incision was made from the symphysis to within three or four inches of the ensiform. Pathology, an immense tumor, retroperitoneal in type, springing from the pelvis, filling almost the entire abdomen, larger than a nine months' pregnancy, firm, very slightly irregular in outline with a large nodule filling the pelvis, lying posteriorly to the uterus. The uterus was slightly smaller than normal. Its appendages were negative with tubes patent.

The tumor was delivered through the abdominal wound, its peritoneal layer opened just above the fundus of the uterus and the fibromyoma was removed by blunt dissection. The oozing was controlled by packing lap sponges and a hot five-yard roll of gauze into the denuded area. The peritoneum was closed by continuous plain suture. The abdominal wall was then closed in layers, by the usual manner.

Postoperatively, there was a slight morbidity. The wound healed by primary union. There was no difficulty encountered by hemorrhage, shock, distention or vomiting. The sutures were removed on the tenth day. However, on the fourteenth day, the patient complained of pain in the lower left extremity. Some edema and slight tenderness were noted on the inner surface of the left thigh and calf. There was slight tenderness also over the lymphatics of the groin. Diagnosis was thrombophlebitis of the long saphenous vein. This, however, cleared up rapidly and the patient was later discharged in excellent physical condition.

The tumor mass weighed twenty-seven pounds. The microscopic diagnosis was fibromyoma without evidence of degeneration.

Examination two months postoperatively showed the uterus in good position, normal size, freely moveable, not tender. The adnexa were palpable and thought to be normal.

DR. SAMUEL LUBIN presented a report of a case of **Double Monster, Ischiopagus**. (For original article, see page 422.)

DR. B. P. WATSON read (by invitation) a paper entitled **Pregnancy and Labor Complicated by Fibroid Tumors**. (For original article see page 351.)

DISCUSSION

DR. HARVEY B. MATTHEWS.—The incidence of fibroids in Dr. Watson's experience is about the same as it has been in ours, about 1 to 1½ per cent. In the last 6,000 cases at the Methodist Episcopal Hospital, there were twenty cases of fibroids complicating labor. Of the early cases up to the twenty-eighth week, there were 15 with fibroids, these being mostly abortions and premature labors. Of the twenty cases at or near term, 8 were spontaneous, 11 were forceps deliveries, one had a classical cesarean section. At the Long Island College Hospital in two years, among 1,985 deliveries, there were 17 cases of fibroids complicating labor, of which 12 were spontaneous, 3 forceps and 2 cesarean section. This again shows that these fibroids do, in the majority of cases, get out of the way of the presenting part and delivery takes place either spontaneously or with ordinary obstetric help. At the Coney Island Hospital, over a period of about fifteen months, we have delivered 1,020 cases without a single case of fibroid complicating pregnancy at or near term. So that we have a total of 9,000 cases with an incidence of fibroids at or near term of 1 in 244.

In the operative treatment of these cases Dr. Watson spoke of myomeetomy versus hysterectomy, or rather, myomeetomy in certain types of cases, and hysterectomy in other types. It seems to me that unless you are anxious to save the woman's

uterus for a subsequent pregnancy, hysterectomy is a better operation than myomectomy in the presence of fibroids.

DR. GORDON GIBSON.—In talking to students I like to boil it down somewhat in this fashion: Given a woman who has a fibroid and has become pregnant, there are four problems to contend with. The first of these is: What is the fibroid going to do to the pregnancy? The second is: What is the fibroid going to do to the labor? The third is: What effect is the fibroid going to have upon the puerperium because we know that fibroids do interfere with drainage of the uterus. They also interfere with involution of the uterus and at times we have very serious after effects as a result. The fourth and last problem to be considered is: What does the pregnancy do to the fibroid?

DR. ALFRED C. BECK.—At the Long Island College Hospital we have learned in the last ten years to be conservative. We do not operate as soon as we used to. The labor we have learned is prolonged if the woman has many fibroids in the uterus, even though they offer no obstruction. The uterus does not contract as it should. We have also learned in possibly a half-dozen cases that large fibroids in the lower uterine segment below the head are pulled up as the cervix dilates. That is particularly true when they are in the anterior or lateral aspect. If they are in the posterior wall, they are not pulled up, and we seldom allow those cases to have any labor. Formerly when a cesarean section was indicated, we did the classical operation and left the uterus, so we have had some experience with fibroids that were left behind. We learned, unfortunately, that very frequently these fibroids interfered with drainage and the convalescence is accompanied by considerable morbidity, and we had several deaths that we though might have been avoided had we done a hysterectomy or myomectomy. Personally, I never have done a myomectomy at this time. We have also observed in patients who delivered spontaneously or who delivered from below, that these fibroids frequently interfered with drainage and if they were infected, the course was a very serious one. Several of our patients died from puerperal infection, even though they delivered and pulled these big fibroids out of the pelvis, and we feel that had we operated upon them, done a hysterectomy or possibly a myomectomy, their lives might have been saved.

DR. RALPH M. BEACH.—When you feel a pedunculated fibroid in the culdesac it is interesting to know where the fibroid springs from. I have had two cases within the last three or four years. One woman was in the early months of pregnancy. She suffered from very severe pain, and we felt a small pedunculated fibroid in the culdesac. We attempted to treat her conservatively with rest, but despite this the pain increased, and when we operated upon her we found that this pedunculated fibroid sprung from the anterior uterine wall, going around the right adnexa, and was in the culdesac. She had another tremendous fibroid in the upper segment and in that case it seemed inadvisable to leave the uterus. In another case where a pedunculated fibroid was in the culdesac, the patient went to six months with practically very few symptoms. It looked as though it was going to be one of those cases that we could carry along and possibly get the tumor out of the pelvis or get her near enough to term so as to deliver a live baby. At about six and a half months she had very severe pain, the tumor became very tender, we could feel liquefaction through the culdesac, and operation was decided upon. On preliminary examination we thought the tumor sprung from the lower part of the posterior wall. On operating we managed to shell this tumor out of the pelvis and found that the pedicle came from a point within about two inches of the fundus on the posterior wall. In that case we removed the tumor,

but unfortunately about forty-eight hours later the patient developed intestinal obstruction and we had to go in again and relieve adhesions and do a hysterotomy at the same time. She made a good recovery and now is pregnant within three weeks of term.

I think the important point brought out by Dr. Watson and which has been emphasized by Dr. Beck and Dr. Matthews is that every time fibroids become tender, this is not an indication for operation and in the past many operations have been done unnecessarily. However, I believe a fast sedimentation time is an indication for operation.

DR. ABRAHAM KOPLOWITZ.—We have seen a good many fibroids on Dr. Mills's service at the Kings County Hospital that were not large enough to interfere with labor. I have always been under the impression that they will involute the same as the uterus will without giving trouble subsequently. Being impressed with that, in taking care of a case something less than a year ago in a woman who had been under my care during the whole course of her pregnancy, but who for some reason or other did not show up in the last four or five weeks when I felt as if I should make one vaginal examination, I entirely missed a large fibroid that had been in the culdesac all the time. She came into the hospital and the intern reported to me that the head was pretty low down, but he could not make out dilatation. On my first rectal examination I could not make out anything. I decided to do a vaginal examination and found the cervix way up under the symphysis and a large fibroid occupying the pelvis. There was only one thing to do and that was a cesarean section. I discussed with her the possibility of a hysterectomy and she asked that if possible the uterus be left in as she did not want to be left with one baby. I did a two-flap operation without any difficulty. The fibroid I found to be subperitoneal and large. I felt that myomectomy would be a comparatively difficult operation and with the idea of waiting for retrogression and making a much easier operation subsequently, I left it in. I saw that woman four months postpartum and at that time I am sorry to say I hardly noticed any change in the size of the fibroid. The question that bothered me was whether I played the part of safety for the patient by leaving that tumor in at the time and not adding any more difficulty to her cesarean section or whether it would have been wiser to remove it.

DR. SAMUEL A. WOLFE.—Dr. Watson has confirmed the observations made in our laboratory, that fibroids of any appreciable size accompanying pregnancy undergo edema or red degeneration with subsequent liquefaction necrosis.

Why so many degenerated fibroids do not produce any clinical picture, even in instances where the tumors are subperitoneal, is yet to be determined. Tumors which have undergone red degeneration and liquefaction necrosis have been noted to grow in a succeeding pregnancy. This is difficult to explain in the light of the necrosis of the tumor.

DR. B. P. WATSON.—The question was raised as to the advisability of performing myomectomy at the same time as the cesarean section. We cannot lay down any general rule that will apply to all cases. In a woman over thirty-five years with multiple fibroids in the uterus I should nearly always do a hysterectomy, but in a young woman anxious to have more children, I think myomectomy is justified and in our hands has given satisfactory results.

In regard to the future history of those patients, I am one of those who believe that the dictum, "Once a cesarean always a cesarean" does not hold; that when cesarean section has been done and the uterine wall has been properly sutured, it is in most instances as strong as ever, if the convalescence has been

afebrile. We have all had the experience of examining uteri some time after cesarean section and have found the same thing, namely that it is very difficult with the naked eye and even microscopically to find the old scar. The same applies to the bed of a tumor after the operation of myomectomy. If we shell the tumor out and bring the wall together in layers, the wall at that part is as strong as any other part of the uterus. So I have no hesitation in allowing a patient to go through labor after myomectomy or after a cesarean section which has been done for some condition other than a contracted pelvis. I think we may be inclined to be too apprehensive of labor in such cases.

In the present series we did not happen to have any case in which a tumor of any size entirely disappeared, but unquestionably it does occur.

I do not know of any definite clinical sign which will tell us when these tumors are liquefied. It is a perfectly aseptic process. There is a slight degree of leucocytosis during the period of pain and tenderness, it is never marked, and we have not noted any change in the leucocyte count or in the sedimentation time in those cases where liquefaction has taken place. After all, this process of necrobiosis is an aseptic one and even when the tumors are broken down there appear to be no general symptoms. Pain and tenderness tend to disappear after the liquefaction takes place.

Dr. Wolfe asked whether these liquefied tumors might grow again in subsequent pregnancies. That I cannot answer categorically. I think possibly we imagine that those tumors are getting bigger during pregnancy simply because they become more easily palpable, especially the subserous ones.

The enucleation of retroperitoneal tumors, is usually easy when it is done at the time of cesarean section. The tissues are all loose and opened out and, in my experience, there has been less bleeding and less difficulty in shelling them out than when it is done in a nonpregnant patient. I did meet with one case where I thought we were dealing with a retroperitoneal fibroid growing from low down in the cervix. I very quickly gave up the attempt on finding that it was not a fibroid growing from the uterus, but a fibroma growing from the lateral pelvic wall.

CHICAGO GYNECOLOGICAL SOCIETY

STATED MEETING, APRIL 17, 1931

DR. ALEXANDER G. GABRIELIANZ described a case of **Fibroma of the Ovary.**

L. C., seventy years of age, white, widow. She had had eleven children; eight now living. Her pregnancies were all normal and deliveries were without instrumental interference. At the age of thirty-seven she had a miscarriage at seven months from unknown cause; after the sixth delivery the patient had puerperal sepsis and remained in bed forty days. The only history of illness was typhoid fever at the age of fourteen.

Menstrual history normal. Climacterium at fifty-five. Her last menstrual period was abundant and lasted seventeen days. She had not lost any weight.

The patient complained of a sudden pain over the entire abdomen followed by gradual enlargement of the abdomen. I first saw the patient twelve hours afterward, at which time the pain was more severe. She had had no bowel movement but she urinated normally. On questioning the patient stated that she had had a similar pain twelve years ago but her abdomen was less distended. She was confined to her bed for one day at that time.

On physical examination the abdomen was found distended, tender, and tympanic. Several soapsuds enemas administered without result. After transfer to the hospital, another enema given but with the same unsatisfactory result.

I then gave the patient spinal anesthesia, to relieve the abdominal distress by relieving the meteorism, and in order to examine the patient further. Shortly after spinal anesthesia with spinoecaine, visible peristalsis started and the patient expelled gas, partly by rectum and partly by eructation. The abdomen became much softer and a tumor mass was easily palpable about four fingers' width above the symphysis and about two inches from the midline on the left side. The mass was the size of a small grapefruit, irregular in shape, with a smooth surface, of hard consistency, movable from side to side downward and with limited mobility upward.

Vaginal examination showed the uterus small, retroflexed, firm, not freely movable, not tender, and the surface was smooth. Adnexa were not palpable. The culdesac was free.

On bimanual examination I could find no relationship between the tumor mass in the abdomen and the uterus, partially due to the meteorism which was still present in a lesser degree, and partially due to the limited mobility of the uterus.

Because the patient had had some relief from the spinal anesthesia, I postponed interference until the following morning, when she was operated upon under spinal anesthesia, using 3 c.c. of spinoecaine. Previous to the operation an injection of 1 c.c. of 5 per cent ephedrin hydrochloride was given.

A midline abdominal incision was made and the tumor mass on a long twisted pedicle was delivered with ease and the operation completed by putting one forceps on the pedicle followed by ligature and peritonization of the stump. The uterus showed no cicatrix. The abdomen was closed in the usual way. The postoperative course was uneventful.

Macroscopic Examination.—Size 12 × 9 × 6 cm. Consistency hard. The tumor was firmly attached to the ovary, which was the size of an English walnut, cystic and contained cheeselike masses. Attached to the ovary and the size of a small navel

orange was a cyst filled with bloody serous fluid. The large stump of the pedicle was black and twisted. The left fallopian tube was apparently healthy but was deeply injected and dark in color.

Diagnosis before operation was not certain but we considered intestinal obstruction. The condition appeared to be a detached uterine fibroid which attached itself parasitically to the left ovary. On further examination of the specimen it was found to be a fibroma of the ovary. This was proved by microscopic sections which showed a mass of hyaline fibrous tissue of a mature type with a few small areas of mononuclear infiltration, the usual interlacing bundles of fibrotic-like tissue being the predominant tissue. Certain areas showed beginning calcification. There was no evidence of any unusual cellular activity of a malignant nature present. The whole picture was that of a benign slow-growing fibroma of the ovary.

DR. LESTER E. FRANKENTHAL, JR., and DR. ALFRED J. KOBAK reported a case of **Trichomonas Vaginalis Occurring Before Menstruation.**

The patient, aged twelve years, had never menstruated, came to the Michael Reese Hospital on February 20, 1931. Examination revealed reddened genitalia bathed in a frothy, purulent discharge. A hanging drop examination showed many motile flagellates and routine uranalysis by the laboratory showed many *Trichomonas vaginalis*. Subsequently we catheterized her and found negative urine both by hanging drop and culture, according to the method of Stein and Cope. A stool examination was likewise negative. Cultures of vaginal secretions yielded a heavy growth of trichomonas. Due to the age of the patient and the intact hymen, the usual vigorous treatment was not undertaken. However, the first month the patient received weekly applications of 5 per cent silver nitrate with daily instillations of 2 per cent mercurochrome. During the next four weeks we substituted daily astringent douches for the mercurochrome instillations. At the present time hanging drop examination still reveals numerous trichomonas and the treatment has not been very successful.

DR. W. C. DANFORTH presented a paper entitled **The Treatment of Occipitoposterior Position With Especial Reference to Manual Rotation.** (For original article see page 360.)

DISCUSSION

DR. D. S. HILLIS.—Although manual rotation is the procedure of choice in cases of occipitoposterior position we also need something in place of manual rotation and this, in my opinion, is the Kjelland forceps. These are not generally used and have gotten into bad repute on account of the large circle that must be described by the handle in order to rotate the head on its long axis. It is a hard thing to do and requires an expert to do it accurately without injury. With the bayonet-shaped forceps this rotation is done with more ease and less danger.

DR. E. L. CORNELL.—I should like to call attention to a method of rotating the posterior head which I described several years ago in an article on forceps. In the left posterior position you use your right hand, while in the right position you use your left hand. Fit the fingers into the upper lambdoid suture and with the pain push the head forward in an upward circular manner toward the pubis, using the lambdoid suture as a lever. A large percentage of these cases will rotate in this way. In most cases, it is a mistake to push the head up and disengage it before making an attempt to rotate it in this manner. It is very sur-

prising the ease with which this procedure is accomplished. After the head is rotated you may allow the patient to go on and deliver or you may apply forceps.

I agree that the anesthetic of choice is ether.

DR. R. W. HOLMES.—It is well that Dr. Danforth did not mention the Scanzoni maneuver for the correction of the malposition. At times, it may be absolutely necessary, but the manual correction is so far superior, and so much safer, as an obstetric procedure, that the latter always should be first attempted. The dangers of injury to the head, and the likely serious mutilation to the maternal soft parts should condemn it. The Kjelland forceps alone should be considered if one must use the Scanzoni procedure. I concur with Dr. Danforth in condemning the procedure of instrumental rotation.

Once in a while, after rotation the head will return to the primary position. In that event it is necessary to pass the hand into the uterus after the cephalic correction, grasp the shoulder and rotate the trunk to an anterior position, then impress the head into the brim.

DR. EMIL RIES read a paper on the Colposcope with particular reference to the use of the instrument in the detection of early cancer of the cervix. (For original article see page 393.)

DISCUSSION

DR. RICHARD A. LIFVENDAHL.—Undoubtedly the instrument opens up a wide field for study in order to correlate what is seen through the instrument and

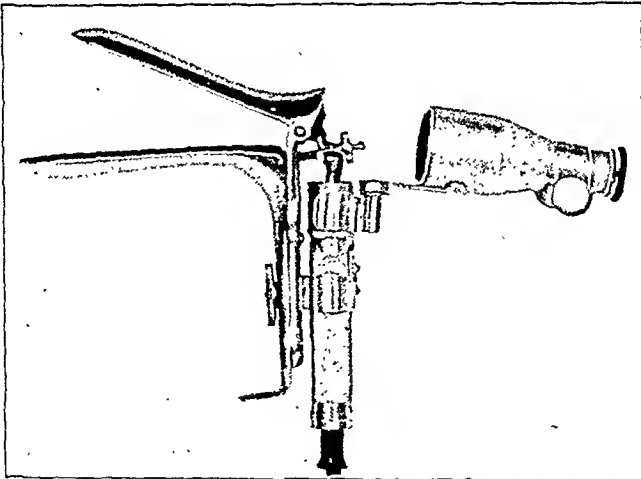


Fig. 1

what the pathologic findings are. Also, it serves to concentrate our attention on the cervix in a more detailed and systematic fashion. Its use should not be confined to the occasional patient in whom we suspect some pathology but should be used routinely in order that we have a better understanding of changes in this region and especially for the detection of early carcinoma. After using the colposcope for a short time I felt that the instrument could be simplified and its expense decreased. The first part of the equipment to consider is the stand which is somewhat cumbersome, heavy, and rather expensive. The second problem was whether binocular vision was really necessary, for we know that in detailed microscopic work many pathologists prefer monocular scopes. With the aid of the Cameron Surgical

Company the instrument demonstrated in the photographs was constructed. (Figs. 1 and 2.) The advantages herein seen are, that it can be attached to any Graves speculum, is very compact, and should be much less expensive. The blades of the speculum in the sample are black plated on their inner surfaces in order to decrease the amount of light reflection. The ordinary 110 volt current is cut down by a rheostat and the cord is detachable from the handle. Another advantage is that

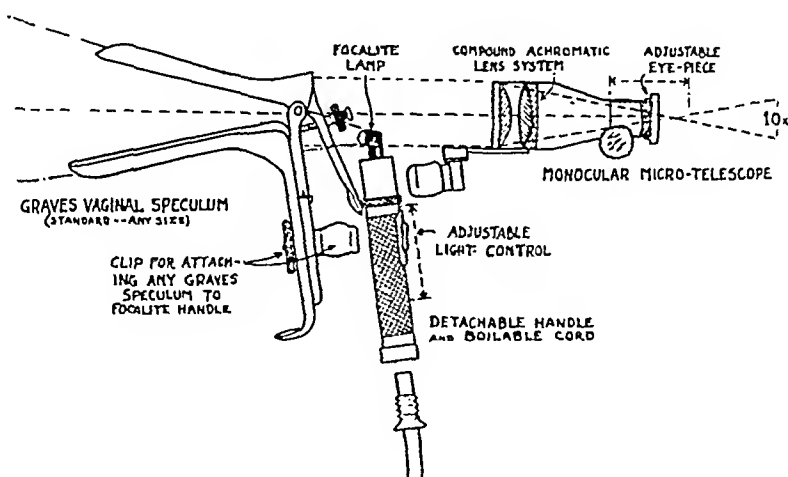


Fig. 2

the optical system can be rotated out of, or removed from the orifice, which leaves an excellent light in the vagina with which one can carry out therapeutic or diagnostic procedures on the cervix or vaginal walls. As the instrument is constructed at this time our field is about three-quarters of that which the Hinselmann scope gives and in addition we do not have the stereoscopic type of optical system which does afford some advantages. However, I feel that the tele-vaginalite will be of great help to us in the earlier diagnosis of cervical lesions.

Department of Book Reviews

CONDUCTED BY ROBERT T. FRANK, M.D., NEW YORK

REVIEW OF NEW BOOKS

OBSTETRICS

A lay publicist presents¹ to lay women a discussion of the Gwathmey method of obstetric colonic analgesia. There is little to criticize in her presentation of the development of the method, the testimony of physicians, or the testimony of patients regarding the benefit of the procedure, except that a few of the letters quoted are rather fulsome in their praise. The remarks on elective version might have been omitted. No one method of lessening pain in labor is applicable to all cases, and elective version, inhalation anesthesia, and various means of producing "twilight sleep" all have their place.

Propaganda of this sort is useful in opening the way to similar popular discussions of other health problems of women, for instance, cancer prophylaxis.

—Philip F. Williams.

*What the Public Should Know About Childbirth*² is designed for the laity but contains much of interest to the profession as well. A short simple history of obstetrics introduces the main topics. Some of the subjects dealt with are superstitions and customs, twilight sleep and its disadvantages, gas-oxygen anesthesia, on the other hand, being favored. The Catholic viewpoint is emphasized throughout, with its influence on the teaching and practice of obstetrics. The writer quotes innumerable authors in such detail that it is frequently disturbing to the reader and interferes with the continuity of the text.

—R. T. Frank.

ENDOCRINOLOGY

The ninth installment of the second volume of the *Handbuch der Inneren Sekretion*³ has just appeared. It contains two subjects, the main one dealing with senility and rejuvenation, which occupies nearly 250 pages and contains much of general interest. It is written by Romeis of Munich.

The thyroid gland in old age undergoes fibrosis (senile atrophy). In the parathyroid, on the other hand, there is an increase in lipoid in the parenchymous cells and connective tissue. The same changes are noted in the hypophysis. The adrenal shows simple senile atrophy. In the testis few changes are noted irrespective whether libido disappears or remains. The ovary of mammals in senility contains a few follicles but no corpus luteum.

¹Easier Motherhood. By Constance L. Todd. New York, The John Day Company, 1931.

²What the Public Should Know About Childbirth. By Walter B. Gossett, M.D., The Midwest Co., Minneapolis, 1931.

³Handbuch der Inneren Sekretion. Herausgegeben von Dr. Max Hirsch. II Band. Lieferung 9. Curt Kabitzsch, Leipzig, 1931.

Vasoligation has proved to give both satisfactory and unsatisfactory results. Other technics with the same object in view including transplantation, are described. Such gonadal transplants rarely survive after four years. The illustrations accompanying this article are good and the literature is dealt with in a fairly satisfactory manner.

Twenty-five pages are devoted to the endocrine aspects of stature and body configuration. This chapter is written by Rautmann of Braunschweig. It is the mesodermal tissues which are mainly influenced by hormones. Therefore the effects are observed in the skeleton, muscles, vascular, genitourinary systems as well as the corium and subcutis. As an index the author uses the body length contrasted with chest circumference and head measurements. The thyroid, prepituitary and gonads are most likely to affect configuration. The article is clearly written but extremely summaristic.

—R. T. Frank.

The second edition of Cotte's book on the *Functional Troubles of the Female Genital Apparatus*⁴ has appeared three years after the first edition, bespeaking its appeal to the medical profession. This voluminous treatise features both the physiologic and clinical aspects. While on the whole the physiology is presented in a most careful, scholarly fashion, the clinical portion occasionally suffers from lack of critique and acceptance of very doubtful data.

The ground covered is formidable. Nothing but a very brief summary can be given. Chapter I deals with the sex cycle in mammalia. Chapter II, which has been added in this edition, considers the disturbance incident to ovulation. Chapter III details the morphologic and functional changes occurring in the tube, vagina, and mammary gland during the sex cycle. Menstrual disturbances are dealt with in Chapter IV. Chapter V discusses the various troubles incident to copulation, perversion, etc., while Chapter VI takes up impregnation, nidation and disturbances of the ovum after impregnation, as well as artificial insemination. Chapter VII deals with the secretions of the genital tract. Chapter VIII covers the circulation of the blood. Chapter IX describes the innervation and its disturbances, and includes operations on the pelvic sympathetic system. The final chapter deals with ovarian insufficiency and castration symptoms.

From this it will be seen that the material dealt with is huge. Unlike many similar books, it impresses by its earnestness, scientific point of view, and surprising knowledge of the world's literature. Because of the real value of the book, I take occasion to point out a few minor details such as inaccuracy in ascribing discoveries to the wrong individual. For example, "folliculin" is noted as discovered in 1928 although I had described its physiologic activity in 1922. The reaction of the female sex hormone upon the cervical glands is credited to Kennedy although it was really published several years before by Piek, Faure and Dohrn. The author doubts the presence of female sex hormone in all but the most recent corpus luteum, although it has been definitely shown, particularly by Allen, that the human corpus luteum contains large quantities of hormone.

Some of the therapeutic measures recommended by the author will certainly eventually require revision. He claims to obtain good results in inducing ovulation by means of prepituitary extracts although as yet the tests performed on all available extracts have proved negative. Likewise his use of antisyphilitic treatment for intermenstrual pain seems unjustified unless a positive Wassermann is noted. Neither can I agree with unilateral castration for this troublesome symptom as I have too often seen patients who were operated upon for this reason, within

⁴*Troubles Fonctionnels de L'Appareil Genital de la Femme.* Par Prof. Gaston Cotte. 2e Edition. Masson et Cie, Paris, 1931.

six months or a year showing the same symptoms on the opposite side. Insulin as a treatment of menorrhagia has likewise not proved effective in most hands.

In spite of some of these minor defects, I may repeat that this book, lavishly illustrated, with an enormous bibliography, and containing in its pages many of the original investigations of the author, is worthy of careful study by all gynecologists.

—R. T. Frank.

Haberlandt's first monograph on this subject was published in 1919. The present monograph⁵ is a summary of the preceding one together with additional experiments performed in the interim. According to the author, transplants of the ovaries of pregnant animals cause temporary sterility in the experimental animal. He was also able to sterilize rabbits with injections of "ovarial opton" prepared according to Abderhalden's method, from the ovaries of pregnant cows, or with "placental opton." This is in sharp contrast with ovarian opton from non-pregnant animals. Fed by mouth this same preparation gives results which are less striking. No bad effects are noted in later pregnancies. The sterilization is effective in rabbits up to three months. He is now ready to try the method clinically with these same preparations.

The literature covering the subject is carefully gone into and utilized to strengthen his thesis. No experimental data are given in this monograph which, on the whole, is not extremely convincing.

—R. T. Frank.

MISCELLANEOUS

Biesenberger's monograph⁶ deals with the deformities of the breast and the cosmetic operations devised for their repair. He has found that a considerable number of women, particularly those of the socially higher ranks and those engaged in active sports, desire to have such disfiguring changes repaired. The types of breasts found are the pendulous, the adipose, and the asymmetrical. In addition, occasionally marked hypertrophy of the breasts likewise requires intervention. Of operations available, amputation, a radical measure; mastopexy, skin plastics, and resection methods are at the disposal of the surgeon. A number of operations are described, including a rather complicated resection of his own devising. This monograph is profusely and adequately illustrated.

—R. T. Frank.

Moench's *Studies on Fertility*⁷ represent a large amount of experimental work performed under a grant made by the National Committee on Maternal Health. It represents the material of 141 intensively studied cases and 60 additional cases not as yet fully worked up.

Instead of being satisfied with the ordinary sperma examinations, the minute characteristics of the sperma have been studied by new methods largely developed in connection with studies performed by the veterinarian, W. W. Williams, as well as Dr. Savage, which have proved of much benefit to the breeders of cattle.

Moench emphasizes that there are intermediate grades between sterility and fertility until the lowest grade of fertility merges into clinical sterility. He feels that in women, abortion and repeated premature births are evidence of minor re-

⁵*Die hormonale Sterilisierung des weiblichen Organismus.* By Dr. med Ludwig Haberlandt. Verlag von Gustav Fischer, Jena, 1931.

⁶*Deformitäten und kosmetische Operationen der weiblichen Brust.* By Hermann Biesenberger. Verlag Wilhelm Maudrich, Wien, 1931.

⁷*Studien zur Fertilität.* By Prof. G. L. Moench. Ferdinand Enke, Stuttgart, 1931.

duction in fertility, put are clinically not definable. In the male, however, intensive study of the sperma cannot only show fertility, but also the degree of fertility of the individual. It should include not only the number and the motility of the spermatozoa but their morphology and the biometry of their head lengths as well. He warns against temporary or accidental reduction of motility. On the other hand, the morphology and particularly the size of the head of the spermatozoon, is most useful in grading the impregnation power of the sperma. In no instance was good male fertility found in men whose sperma showed more than 20 per cent of abnormal spermatozoan heads. This is a most valuable contribution to fertility studies.

—R. T. Frank.

Books Received

COURTS AND DOCTORS. By Lloyd Paul Stryker. New York, The Macmillan Company, 1932.

FEMALE SEX HORMONOLOGY. By William P. Graves, Professor of Gynecology at Harvard Medical School, etc. Illustrated. W. B. Saunders Company, Philadelphia, 1931.

SURGEON GENERAL OF PUBLIC HEALTH SERVICE. Annual Report for the Fiscal Year 1931. United States Government Printing Office, Washington, 1931.

MAN AND WOMAN IN MARRIAGE. By C. B. S. Evans, Member of Faculty of Northwestern University Medical School, etc., With an introduction by Rudolph Wieser Holmes. Chicago, Bruse-Roberts, Inc., 1931.

ERGOT AND ERGOTISM. By Dr. George Barger, Professor of Chemistry in University of Edinburgh. London and Edinburgh, Gurney and Jackson, 1931.

SEX HOSTILITY IN MARRIAGE. By Dr. Th. H. Van de Velde. Translated from the German. New York, Covici, Friede, 1931.

MEDICAL REPORT FOR THE YEAR 1930. Glasgow Royal Maternity and Women's Hospital. Glasgow, 1931.

CAESAREAN SECTION, an Analysis of 352 Consecutive Cases, etc. By Frances Ivens-Knowles, Clapham Maternity Hospital, London. J. & A. Churchill, London, 1931.

DIE PFLEGE DER FRAU. Von Professor Dr. Ludwig Adler, Zweite Auflage. Wien. Franz Deuticke, 1932.

WECHSELJAHRE DER FRAU. Von Geh. Rat Professor Dr. Hugo Sellheim, Universitaets Frauenklinik in Leipzig. Stuttgart, Ferdinand Enke, 1932.

DÉPISTAGE DE LA SYPHILIS en Pratique Obstétricale. Par P. Rudaux, Accoucheur, Maternité de Paris, et H. Montlaur, Assistant de Syphiligraphie, Maternité de Paris. Masson et Cie, éditeurs, Paris, 1931.

RADIOTHERAPIE. Par Ch. Guilbert, avec la Collaboration du Dr. Jean Quivy. N. Maloine, éditeurs, Paris, 1932.

LES LÉSIONS CÉRÉBRO-MÉNINGÉES À LA NAISSANCE. Par Robert Waitz, Ancien Interne des Hôpitaux de Paris. G. Doin & Cie, éditeurs, Paris, 1931.

Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Selected Abstracts

Pathology of Pregnancy

Cabanes, P. A.: A Simple Treatment of Hyperemesis Gravidarum. Bull. de la Soc. d'obst. et de gynéc. 6: 420, 1930.

Eleven cases of hyperemesis gravidarum are reported by Cabanes in which cures were obtained by either the production of fixation abscesses or the injection of aseptic pus. In all the cases the vomiting subsided rapidly after the injections and the pregnancy continued unmolested in all cases but one where typhoid fever was present. The author, however, does attach great importance to the diet which is as follows: restriction of fluids, frequently repeated small meals composed of purées of vegetables and fruit, and glucose injections to prevent dehydration.

J. P. GREENHILL.

Aburel, E.: Considerations of the Pathogenesis and Treatment of Vomiting in Pregnancy. Bull. de la Soc. d'obst. et de gynéc. 7: 34, 1931.

The author's conception of the mechanism of vomiting during pregnancy is as follows: In a nervous, spasmophilic and susceptible individual, the irritation of the uterus during pregnancy produces an uterogastric reflex. The uterus incites a spasm of the pyloric portion of the stomach and vomiting results. The author says he verified his idea of the pathogenesis of vomiting in pregnancy by therapeutic results which he obtained by anesthetizing the centripetal path of the uterus. By anesthetizing the lumbo-aortic plexus one may give a woman who has not been able to keep any food in her stomach, a large meal which will be well tolerated. Two cases are reported in which complete cures were obtained after two anesthetics.

J. P. GREENHILL.

Saenger, H.: Death From Hyperemesis Gravidarum. Arch. f. Gynäk. 142: 152, 1930.

The author reviews at length the history of hyperemesis gravidarum and gives a résumé of all the 33 cases in the literature, which ended fatally. He also adds one case of his own. An analysis of the reported cases leads Saenger to conclude that pregnancy should be terminated promptly for continuous and uninterrupted vomiting, especially when lasting more than one week with a pulse above 96, marked loss of weight and weakness. The interruption should be done, if at all, before the ninth week of pregnancy as all the reported deaths occurred after the ninth week. The development of neuritides, pyrexia, or icterus are forebodings of serious pathologic changes and clearly indicate prompt interruption of the pregnancy. The negative chemico-physical findings are of no value in the prognosis. The development of fever, or of cerebral changes such as apathy, delirium, etc., are evidences that the proper moment for interruption has already passed.

RALPH A. REIS.

Willibald: Menstruation-like Hemorrhages During Pregnancy. *Monatschr. f. Geburtsh. u. Gynäk.* 85: 233, 1930.

Literature offers many instances of the occurrence of menstruation-like hemorrhages during pregnancy. Willibald studied the histories of 2,800 pregnant women and found that 20 of them (0.7 per cent) had such hemorrhages. From this study and the reports in literature, he concludes that the mild hemorrhages which occur during pregnancy at the time a patient would menstruate if she were not pregnant are not true menstrual periods. They have no significance in the determination of the day of confinement. However, if the amount and duration of bleeding during pregnancy are the same as the patient's regular menses and the patient's history is accurate, this bleeding may be confused with a true menstrual period. The last regular period then cannot be determined with accuracy. In such cases, the date of the last menses cannot be used in a law court to determine the duration of pregnancy.

J. P. GREENHILL.

Martines: On the Histology of Cervical Polypi in Pregnancy. *Folia gynae.* 26: 4, 1929.

Examining some polypi in the cervical canal of a woman, pregnant seven months, the author found the usual characteristics of this growth associated with abundant decidual reaction, surrounding the polypoid growths like a cuff. He thinks that the decidual elements originate from the investment cells of glands inclosed in the polypi, and therefore, these findings give support to Sfameni, who believes the placenta to be of an epithelial origin.

SYDNEY S. SCHOCHET.
JULIUS E. LACKNER.

Henkel: Abdominal Aspiration of Hydramnion Fluid. *Deutsche med. Wehnschr.* 56: 1249, 1930.

Abdominal aspiration for the relief of pregnant women suffering from pressure symptoms of a hydramnion is recommended in preference to perforation of the membranes by the vaginal route. The possibility of controlling the quantity of the drained fluid permits correction of fetal position and prevents the disastrous, premature separation of the placenta.

G. E. GRUENFELD.

Momigliano: On the Rôle of the Amniotic Epithelium in the Genesis of Hydramnios. *Arch. di obst. & ginec.* 16: 443, 1929.

From an examination of the structure of the amniotic epithelium in 11 cases of hydramnios, the author suggests that this epithelium participates in the genesis of hydramnios through a marked increase of the secreting surface.

SYDNEY S. SCHOCHET.
JULIUS E. LACKNER.

Kermauner: Constitution in Obstetrics. *Wien. klin. Wehnschr.* 43: 14, 1930.

The classification of individuals in terms of specific constitutional features and factors is not an acceptable procedure. The factors governing "constitution" are not constant being subject to change, and the period of change cannot be prophesied. Also, specific diseases may have definite and lasting effects which can bear no relationship to constitutional type. Very often the "constitution" of the individual is blamed for symptoms attributable to a large variety of overlooked conditions.

The inclusion of static-dynamic concepts such as irritability and resistance in the term constitution is of little practical value. In the last analysis each individual must be judged by himself.

In obstetrics "constitution" as an influence in the determination of results is found especially wanting. In the light of advances in the field of metabolism during pregnancy which were presented at recent gynecologic conferences and will take years to digest, constitution must be pushed farther and farther into the background. Constitutional factors have not been found to stand in direct relation to such conditions as hyperemesis gravidarum, thrombosis and embolism, chloasma and viteligo, and marked hirsuties. As far as relations to labor, labor pains, and postpartum hemorrhage are concerned the term only serves to cloak our ignorance. The same applies to considerations of multiple pregnancies and such conditions as the preponderance of males over females in any family.

FRANK SPIELMAN.

Arbruzzese: Relations of Constitutional Affinity of Parents to Fetal Development. *Riv. ital. ginec.* 11: 4, 1930.

Researches lead the author to the conclusion that fetal development depends upon the constitutional affinity or disaffinity of the parents. When parents are constitutionally different, more deficient fetuses are born, while in the case of parental similarity the fetus more likely is normal or overdeveloped.

SYDNEY S. SCHROCHET.

JULIUS E. LACKNER.

Jerlov, E.: The Lack of Hemoglobin During Pregnancy and a Suggestion on the Prophylaxis of Anemia. *Acta obst. et gynec. Scandinav.* 8: 356, 1929.

The author made hemoglobin determinations on 1143 pregnant women and found that 25.9 per cent of them had a hemoglobin of less than 70 per cent. He found a progressive decrease in hemoglobin as pregnancy advances. From the third month to the tenth, the average hemoglobin reading for each month was as follows: 83 per cent, 78.4 per cent, 78 per cent, 75.3 per cent, 75 per cent, 73.9 per cent, 73.2 per cent, and 71.1 per cent. Treatment by means of iron, arsenic and fresh vegetables produced an improvement in 90 per cent of the cases. In 5 per cent no change was observed and in the remaining 5 per cent the hemoglobin reading decreased in spite of treatment.

J. P. GREENHILL.

Suwa, Y.: Hematologic Investigation of Anemia in Pregnancy. Part I. Changes in the Blood Picture in Cases of Normal Pregnancy, Labor and the Puerperium. *Japanese J.-Obst. & Gynec.* 13: 73, 1930.

The author examined the blood of 146 pregnant women. He found no change up to the fourth month either in primiparas or multiparas. However, in the middle of gestation there was a diminution in both the number of red blood cells and in the hemoglobin. In primiparas the greatest decrease was in the ninth month and in multiparas this occurred in the tenth month. A slight decrease was noted in the first and second stages of labor but the greatest drop occurred during the first to the third days after delivery. After that there was a gradual return to normal. As pregnancy advanced the number of leucocytes increased but during the eighth month they decreased. The number decreased during the puerperium, returning to normal between the fourth and seventh days.

J. P. GREENHILL.

Suwa, Y.: Hematologic Investigation of Anemia in Pregnancy. Part II. Anemic Women in Pregnancy, Labor and the Puerperium. Japanese J. Obst. & Gynec. 13: 79, 1930.

In a series of cases of anemia which occurred during pregnancy Suwa found the following causes for the anemia: (1) Chlorosis. This was more frequent in women between twenty and thirty-five years of age. It did not cause any complications during pregnancy but it was aggravated by the gestation. (2) Repeated hemorrhages during pregnancy. (3) Unexplained anemia during normal pregnancy. (4) Acute anemia due to hemorrhages during labor. (5) Pernicious-like anemia which is due to a toxemia of pregnancy.

J. P. GREENHILL.

Maisel, E.: Pernicious Types of Pregnancy Anemias. Zentralbl. f. Gynäk. 54: 2409, 1930.

True anemias of pregnancy recover spontaneously after delivery and in this respect are different from a pernicious anemia of the Addison, Biermer type. They occur usually in the second half of pregnancy and seem to have a predilection for parous women. The author's conclusions are: The pregnancy is the cause of the anemia; the children are premature and delicate; the birth is not attended with unusual bleeding; arsenic and iron are useful remedies, but the best treatment is fractional blood transfusion, 20 to 30 c.c. given daily or every other day on 7-10 occasions. Calf's liver, 100 to 150 gm. per day, is also very helpful.

WILLIAM F. MENGERT.

Item

The American Board of Obstetrics and Gynecology

The next written examination of the Board will be held in nineteen (19) different cities of the United States and Canada at 2 P.M. on Saturday, March 26, 1932. The general, oral and clinical, examination will be held in New Orleans on Tuesday, May 10, 1932, immediately preceding the meeting of the American Medical Association. Reduced railroad fares will be available. For detailed information and application blanks apply to the Secretary, Dr. Paul Titus, 1015 Highland Building, Pittsburgh, Pennsylvania.

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No. 4

Original Communications

THE VALUE OF THE VARIOUS KIDNEY FUNCTION TESTS IN THE DIFFERENTIATION OF THE TOXEMIAS OF PREGNANCY

By H. J. STANDER, M.D., PAUL ASHTON, M.D., AND J. F. CADDEN, M.D.,
BALTIMORE, Md.

(From the Department of Obstetrics, Johns Hopkins University and Hospital)

THE majority of patients suffering from a toxemia of pregnancy fall into one of the three types known as nephritic, preeclamptic, and low reserve kidney. It is in the differentiation between these types that a great deal of confusion still exists. In the nephritic group fall all cases with definite kidney disease; in the preeclamptic group those showing the signs and symptoms which may eventuate in eclampsia; and in the low reserve kidney group those manifesting late in pregnancy signs of inadequate renal function which disappear completely within the month following delivery. One of us has fully defined these groups in earlier publications.¹

Unfortunately, in about one-tenth of our patients the differential diagnosis between these three types of toxemia of pregnancy is quite difficult. In a recent follow-up study in this Clinic, Peckham and Stout² found that by following our criteria for these groups, 11 per cent proved to have been wrongly diagnosed at the time of discharge from the hospital. A rapidly developing marked preeclampsia, a pronounced chronic nephritis, or a mild low reserve kidney, responding rapidly to treatment, are readily recognizable, but it is not an easy task to group correctly the borderline case, which may be a pronounced low reserve kidney, a very mild or early nephritis, or a slowly developing preeclampsia.

It is because of this difficulty in differentiation in a certain percentage of cases that we undertook to carry out a systematic study of the various kidney function tests which seemed worthy of investigation. During the past two years we have conducted such tests on 65 patients, including 19

NOTE: The Editor accepts no responsibility for the views and statements of authors as published in their "Original Communications."

normal pregnancies. In the majority of our cases, all the renal function tests studied were made on each patient, and in many instances the various tests were repeated on the same patient.

TESTS EMPLOYED

The following kidney function tests were used: (1) Mosenthal concentration test; (2) phenolsulphonephthalein test; (3) urea clearance test; (4) urea concentration factor; (5) diastase test; (6) creatinine test; (7) guanidine test; (8) thiosulphate test.

The Mosenthal concentration test was carried out strictly according to the directions of the author,² and in our Tables I to III are reported the variations in specific gravity of the various urine specimens, the night urine volume in cubic centimeters, the urine nitrogen, and the urine chlorides in percentages.

The phenolsulphonephthalein test was performed by obtaining first and second hour urine specimens, as well as by the Shaw modification⁴ involving half-hour specimens. In our tables the percentage of dye excreted is recorded for the four half-hour periods under four columns labelled 1, 2, 3, 4, respectively, and the total excretion is given in the last column.

Urea clearances were determined according to the method described by Möller, McIntosh and Van Slyke.⁵ In some cases urea was given by mouth, while in others the patient had breakfast preceding the test. The standard as well as the maximum clearances are reported as percentages of the mean normal, and given in two columns for first and second hours, with the averages in the final column.

The urea concentration factor was determined according to the technic described by Rabinowitch and Patch,⁶ and is written in a separate column in the tables. The factor was calculated as follows:

$$\frac{\text{Urine urea concentration (second hour)}}{\text{Blood urea concentration before and blood urea after}} = 2$$

The diastase test was performed according to the method of MacLean,⁷ and represents the amylose content of the urine.

The creatinine and guanidine tests were carried out according to the instructions of Major.⁸ The results for these tests are not shown in the tables but are graphically demonstrated in Figs. 2 and 3.

The thiosulphate test used is that of Nyiri.⁹ The sodium benzoate test as suggested by Kingshury and Swanson,¹⁰ as well as the Andrew's diazo test¹¹ were not studied as the determination of hippuric acid in the former is somewhat complicated for a routine clinical procedure, while the color reaction in the latter is not very sharp.

RESULTS

Nineteen cases of normal pregnancy were studied and the results for the Mosenthal, phthalein, urea clearance, urea concentration factor and

TABLE I. NORMAL PREGNANCY NEAR TERM

CASE	MOSENFELT TEST				PTHIALEIN TEST					UREA CLEARANCE			UREA CON. FACTOR	DIASTASE TEST
	SP. GR. VAR.	VOL. IN C.C.	N. PER CENT	CL. PER CENT	1	2	3	4	TOTAL	1	2	AVER.		
1	12	240	1.04	0.79		56.1		10.7	66.8				96.2	6.6
2	3	760	0.53	0.82									55.1	
3	12	780	0.42	0.72									39.5	
4					52.0	12.0	8.2	6.9	89.1				22.3	
5	17	250			62.7	11.5	8.1						38.2	6.6
6													40.9	
7	10	235	0.98	1.57		75.0		5.0	80.0				38.6	
8													41.4	
9	7	270	0.82	1.52				?	61 +				32.9	3.3
10	9	850	0.61	1.52		61.0		1.8	78.8				27.2	
11	12	370	1.41	1.38	51.3	19.6	6.1	22.7	51.2					
12	12	430	1.07	0.79		28.5		16.5	63.1					
13	9	640	0.92	1.59		46.6		24.0	91.3					68.4
14	8					67.3								
15	19	550	0.47	0.85	45.6	19.5	7.0	3.9	76.0	88.4	116	102.2	68.4	
16					47.6	9.7	5.9	3.1	66.3	84.0	103	94.0	54.2	
17										59.0	124	92		5.5
18										116.0	107	110		
19														
Aver.	10.8	488.6	0.83	1.15					67.4			99.5	46.2	
Normal nonpreg-nant	9 or over	Under 750	1 per cent or higher	1 per cent or higher					60-85			80-120	40-50	6 or over

diastase tests, are recorded in Table I. At the bottom of this table are also given the normal values, as usually stated, in order to permit comparison with our findings in normal pregnancy. It will be seen that although the averages for normal pregnancy agree fairly well with the

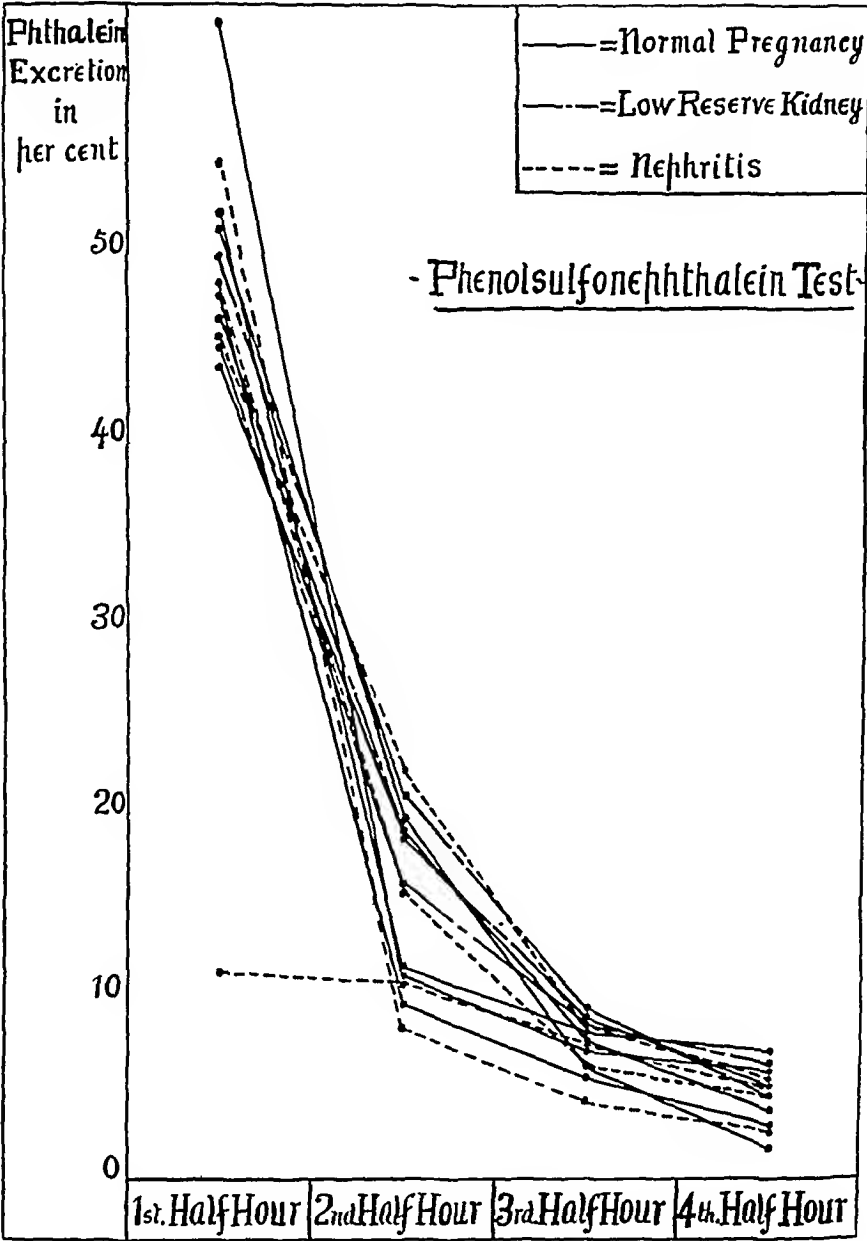


Fig. 1

accepted normal figures, there are wide variations in individual cases for all these tests with the exception of the phenolsulphonephthalein and urea clearance tests.

In Tables II and III we record the values obtained in patients suffering from low reserve kidney and nephritis, respectively. From a study of

TABLE II. LOW RESERVE KIDNEY

CASE	MOSENFELT TEST				PHTHALEIN TEST				UREA CLEARANCE			UREA CON. FACTOR	DIASTASE TEST
	SP. GR. VAR.	VOL. IN C.C.	N. PER CENT	CL. PER CENT	1	2	3	4	TOTAL	1	2	AVER.	
20	9	330	0.61	1.2	46.5	19.4	8.2	4.4	78.5				4.4
21	20					65.0		15.0	80.0				
22	6	270	0.41	0.25	45.4	16.2	8.0	6.3	75.7	146	98.0	122.0	26.2
23	11	570	0.77	0.63	50.0	20.4	9.0	4.9	84.3	114	114.0	114.0	53.1
24	5	73	1.51	3.97		69.4		9.8	79.2				40.5
25	5	700	0.50	0.77		47.0		15.0	62.0				13.3
26	8	730	0.45	1.15									54.6
27						50.0		10.0	60.0	45.3	77.4	62.0	2.0
Aver.	9.1	445	0.71	1.3					74.2			99.3	38.6

TABLE III. NEPHRITIS

CASE	MOSENFELT TEST				PHTHALEIN TEST					UREA CLEARANCE			UREA CON. FACTOR	DIASTASE TEST
	SP. GR. VAR.	VOL. IN C.C.	N. PER CENT	CL. PER CENT	1	2	3	4	TOTAL	1	2	AVER.		
28	12	370	0.76	0.78	46.4	22.5	9.8	5.7	84.4				34.8	
29	10	440	1.11	0.43									25.7	
30	15													
31					11.5	11.3	8.2	5.2	36.2					
32	9	415			48.7	16.1	9.5	5.6	79.9	47.4	88.9	68.1	67.9	
33	11	340	0.94	0.79		35.0		10.0	45.0					
34					17.0					138.	1.1	69.5		
35	4					25.0		10.0	35.0			75.0		
36	6					40.0		10.0	50.0			80.0		
37	5	340	0.91	0.68		35.0		10.0	45.0				45.2	
38										56.	67.5	61.7		
39										74.1	81.0	77.5		
40										44.4	66.6	55.5		
41										99.2	99.3	94.2		
42	5	590	0.44	0.68	56.6	9.4	4.8	3.1	73.9	56.0	63.3	60.0	29.9	3.3
Aver.	8.5	416	0.83	0.73					56.1			71.2	40.7	

these tables it will be noted that the Mosenthal test was not of definite value in differentiating between these types of toxemia, the average specific gravity variation for low reserve kidney being 9.1 and for nephritis 8.5, values that are both just below the normal. The same may be said for the urea concentration factor and the diastase test. The phthalein excretion test is of value only in cases of marked kidney impairment but is of little help in the milder cases. The urea clearance appears to be of definite value. It will be seen that while the normal nonpregnant finding

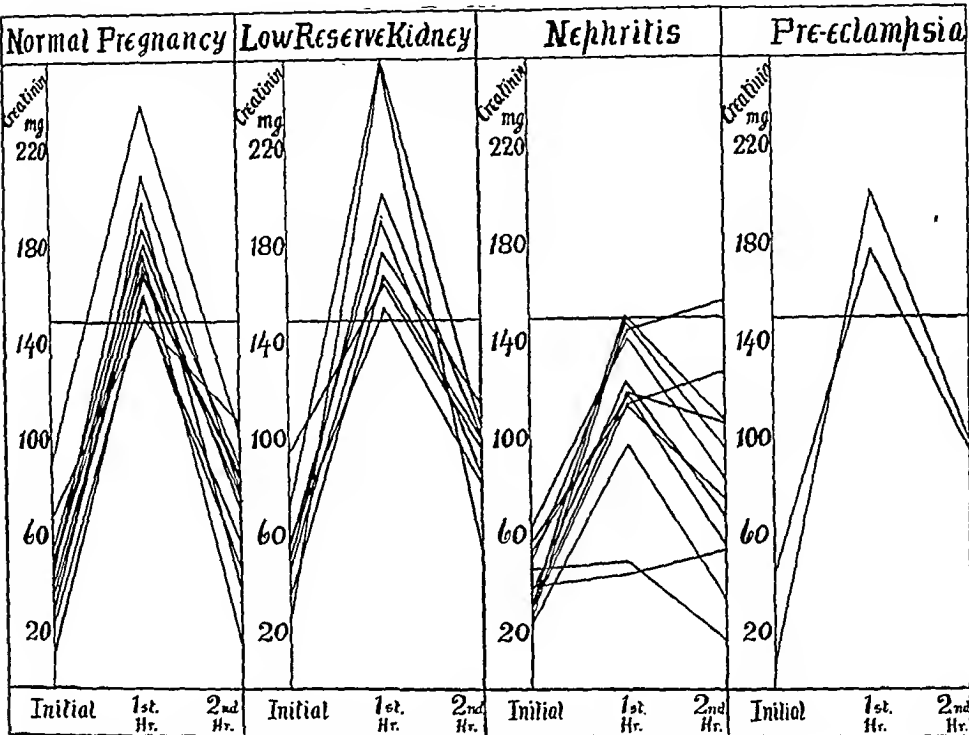


Fig. 2.—Creatinine test.

is between 80 and 120 per cent, it falls within that range in our normal pregnant women and in cases of low reserve kidney and preeclampsia, while the nephritic patients show clearances definitely below the lower limit of normal.

The results of the creatinine and guanidine tests revealed outstanding differences between nephritis and the other two groups, low reserve kidney and preeclampsia. These differences are clearly shown in Figs. 2 and 3. All our nephritic patients showed an excretion below the lower limit of normal.

The results with the thiosulphate tests of Nyiri were disappointing. Applied to a case of normal pregnancy we found 19.9 per cent excreted in the urine, while the author gives the normal range of from 30 to 40 per cent, and for kidney disease values ranging between 1 and 23 per cent. Further application of this test in five patients corroborated the view that it is not of great value, in so far as we have studied it, in the toxemias of pregnancy.

COMMENT

The phenolsulphonephthalein test, even when carried out in half-hour periods, is not of value in the differentiation between mild or incipient cases of renal disease and the other toxemias of pregnancy. This is well

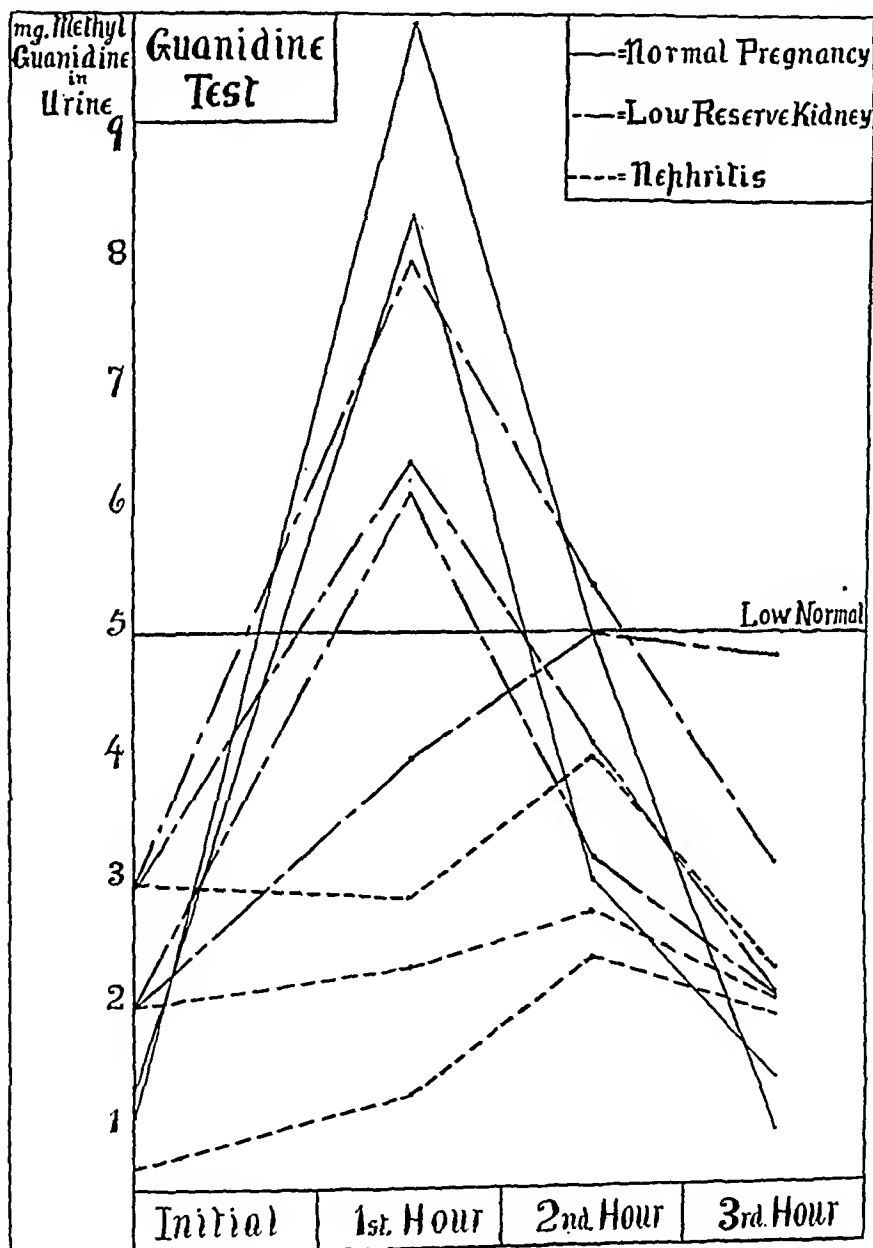


Fig. 3

demonstrated in Fig. 1. The same may be said of the Mosenthal, diastase and thiosulphate tests.

The urea concentration tests are of value, and of these the clearance test devised by Van Slyke and his associates promises to be the most helpful. It certainly seems that this test will aid us in the early recognition

of mild or beginning nephritis. Values definitely below 80 per cent of the mean normal should be regarded as of serious import. We strongly recommend this test in borderline cases where a differential diagnosis is difficult. The technic for determining the urea clearance as a measure of renal efficiency is carried out as follows:

The patient must remain quietly in bed during the two-hour test period. The preferable period for running the test is between breakfast

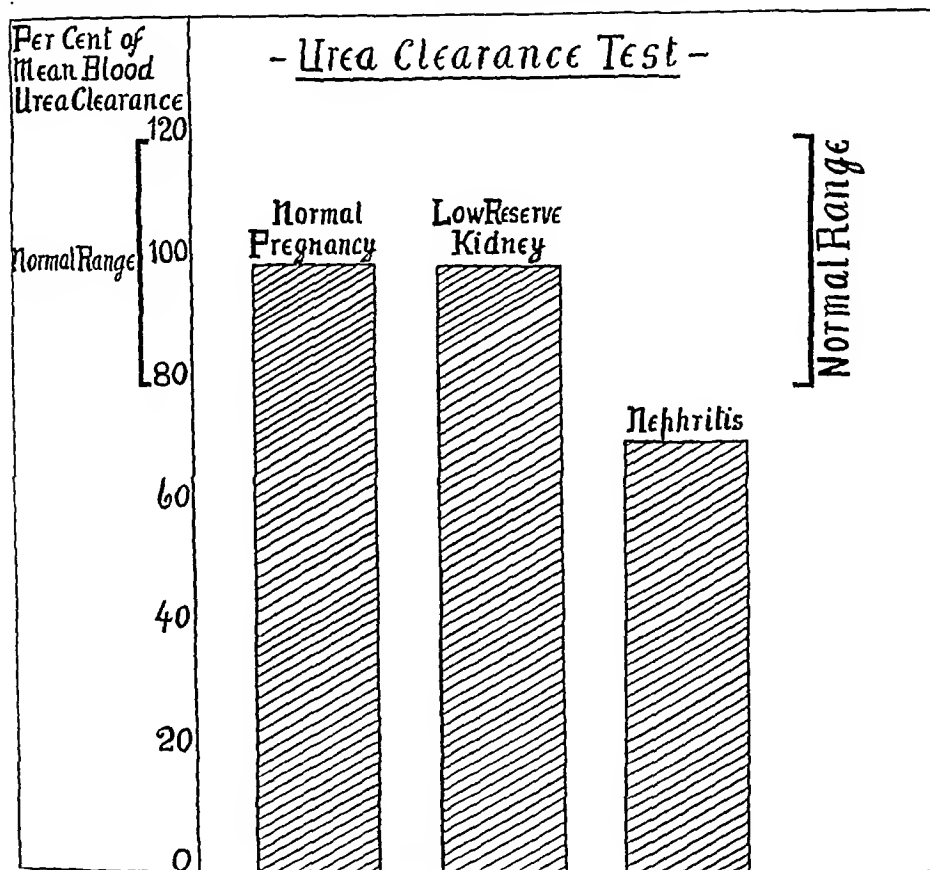


Fig. 4

and lunch; and so as not to interfere with the routine ward work, the best period is 8:00 to 10:00 A.M.

TEST

The patient is given the regular ward breakfast at 6:00 A.M., but *without* coffee or tea.

1. The patient voids at 8:00 A.M., and is given 200 c.c. of water. Specimen is discarded and the time of voiding noted carefully.

2. Slightly before 9:00 A.M., a sample of blood (about 20 c.c.) is taken, and sent to laboratory.

3. At 9:00 A.M., a specimen of urine is collected; 200 c.c. more water given. The exact time of this urine collection is again carefully noted and the specimen saved for laboratory.

4. At 10:00 A.M., another urine specimen is collected, the time of collection carefully noted, and the specimen saved for laboratory.

FORMULA

If urine volume per minute is 2 c.c. or above, use the following formula:

$$C_m = \frac{U \times V}{B} \times \frac{1.73}{A}$$

where C_m is maximum urea clearance,
 U is urea nitrogen per 100 c.c. urine,
 V is minute volume of urine,
 B is urea nitrogen per 100 c.c. blood,
 A is body surface area in square metres.

If volume is below 2 c.c. per minute,

$$C_s = \frac{U}{B} \sqrt{V \times \frac{1.73}{A}}$$

If we wish to express the urea clearance in percentage of normal, the above formulae are changed as follows:

$$C_m = 1.33 \frac{U \times V}{B} \times \frac{1.73}{A}$$

$$C_s = 1.85 \frac{U}{B} \sqrt{V \times \frac{1.73}{A}}$$

It is suggested that the urea clearance in all cases be reported as percentages of normal. The urine urea is determined by the Folin method¹² and the blood urea by that of Looney.¹³

The creatinine and guanidine tests of Major are of definite help to us. These tests run fairly parallel, and as the guanidine determinations are quite tedious and complicated, we recommend the use of the creatinine test. The procedure is simple. The test is carried out by collecting the urine for one hour, then injecting intravenously 0.5 gm. of creatinine. The amount of creatinine excreted in the urine during the first and second hours after the injection is compared with the creatinine content of the urine before injection. The results are best recorded in a graph as shown in Fig. 2. The creatinine may be put up in 10 c.c. sterile ampoules containing 0.5 gram creatinine in buffer solution of P_H 6.9. The determination of creatinine in the urine is an easy and short procedure, requiring simple apparatus.¹⁴

We have attempted to evaluate the various kidney function tests in order to determine which of them are of definite value in the recognition of a beginning or mild nephritis, where in cases in which signs and symptoms of the disease may be confused with low reserve kidney or pre-eclampsia. We feel strongly that all cases of nephritis, however mild, complicating pregnancy, should be recognized and treated properly, especially in view of the recent follow-up study of Stander and Peckham,¹⁵ in which they found a maternal mortality, occurring within ten years, of over 40 per cent in their patients suffering from nephritis during pregnancy.

CONCLUSIONS

1. Of the Mosenthal, phenolsulphonaphthalein, diastase, thiosulphate, urea concentration factor, urea clearance, guanidine and creatinine excretion tests, the latter three proved of real value in the differentiation between mild nephritis and the other toxemias of pregnancy.

2. We recommend the urea clearance and creatinine excretion tests for routine use in all cases of toxemia of pregnancy where the diagnosis is not clear. A urea clearance of below 80 per cent of the mean normal, and a creatinine excretion below 155 mg. in the first hour, are strongly indicative of renal damage.

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MICROSCOPIC CEREBRAL HEMORRHAGE IN STILLBIRTHS AND NEWBORN DEATHS

A STUDY OF FIFTY-THREE INFANTS WITH RELATION TO MINUTE HEMORRHAGES OF THE MEDULLA OBLONGATA

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IT SEEMS imperative to obtain more definite pathologic evidence of the cause of death in that group of children, stillborn or dying shortly after birth, so frequently certified as "atelectasis, asphyxia, inhalation of amniotic fluid, tentorial laceration, or cause of death undetermined."

Among others Crothers¹ has emphasized the predominant role of injury to the medulla oblongata as the important factor in birth trauma. In the studies of Schwartz² the brains of a large proportion of infants up to the age of five months had microscopic hemorrhages or distinct areas of degeneration in the regions adjacent to the lateral ventricles. These findings caused us to undertake microscopic examination of the medulla oblongata in a series of infants stillborn, or dying shortly after birth, to determine the presence of hemorrhages in that region.

We present the results of 53 autopsies from the New York Lying-In Hospital. This series was selected consecutively on the basis of development and freshness of the material and were all done personally by one

of us (Hemsath). The bodies were placed in the mortuary refrigerator at a temperature of 5° C., pending autopsy which included examination of head, trunk, and long bones. The histologic examination of the



Fig. 1.—(No. 78561.) Mass of blood at side of medulla. $\times 60$. Cresylviolet stain.

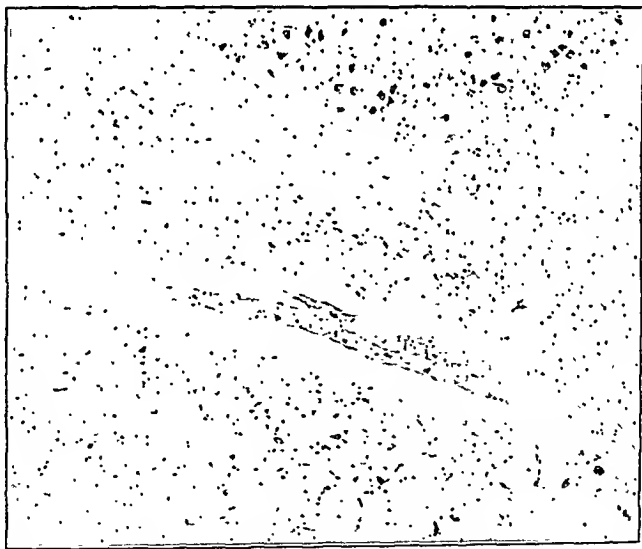


Fig. 2.—(No. 78308.) Note blood outside of vessel wall. $\times 120$. Cresylviolet stain

medullae was made by one of us (Canavan) without recourse to any data other than the weight of the bodies and the number of hours postmortem of the autopsy, and the amount of tissue used was about one gram in weight. We are reporting on single or at most two sections, cut six and two-thirds microns, and stained by a simple dye. Since we are considering for the moment findings which bear on the death of the infant, no

details will be given at this time of the histology of the medullae at this age, which is of much interest from the anatomist's point of view, but confine our figures to the vascular lesions which are in this study of prime importance. No instance of meningitis was seen.

Table I lists the 53 cases with relation to stillbirth or death, maturity, race, Wassermann reaction, and operative delivery. The etiologic factors in the causation of death of these 53 infants is given in Table II.

Microscopic hemorrhage in the medulla oblongata occurred in 34 cases or 64 per cent of this series, with equal incidence among stillbirths and

TABLE I. FIFTY-THREE INFANTS. GENERAL FACTS

	STILLBIRTHS		NEWBORN DEATHS	
	NUMBER	PER CENT	NUMBER	PER CENT
Total number	21		32	
Mature (weight over 2500 gm.)	15	71	20	63
Premature, viable (weight 1500 to 2500 gm.)	6	29	7	21
Premature, nonviable (weight 1000 to 1500 gm.)	—		5	16
Race, white	19	90	26	81
black	2	10	6	19
Wassermann reaction positive	1	5	3	10
Operative deliveries	14	66	18	56

TABLE II. ETIOLOGIC CLASSIFICATION OF DEATHS IN FIFTY-THREE CASES

	STILLBIRTHS		NEWBORN DEATHS	
	TOTAL NUMBER	NO. SHOWING MICROSCOPIC HEMORRHAGES OF MEDULLA	TOTAL NUMBER	NO. SHOWING MICROSCOPIC HEMORRHAGES OF MEDULLA
Complications of labor	13	9	12	8
Antepartum hemorrhage (including placenta previa)	5	3	2	1
Toxemia of pregnancy	2	2	—	—
Syphilis	—	—	1	1
Maternal diseases	1	—	—	—
Congenital disease or defects* (excluding syphilis)	—	—	3	3
Prematurity	—	—	7	3
Deaths due to postnatal causes	—	—	7	4
Totals	21	14	32	20

*General edema of fetus, habitual icterus gravis, renal aplasia.

TABLE III. STILLBIRTHS. FOURTEEN CASES SHOWING MICROSCOPIC HEMORRHAGES IN THE MEDULLA OBLONGATA* †

HOSPITAL NUMBER	WEIGHT, GRAMS	ETIOLOGIC CAUSE OF STILLBIRTH	OTHER ANATOMICAL DIAGNOSIS
78114	2680	Funis coiled about neck	Subserous petechiae of thoracic organs
78308	1800	Accidental hemorrhage	Subserous petechiae of thoracic organs
78327	2205	Prolapse of funis	Subserous petechiae of thoracic organs
78430	3525	Funis coiled three times about neck	Subserous petechiae of thoracic organs
79230‡	2700	Prolonged dry labor in V.O.P.	Edema of leptomeninges
79572	4300	Prolonged dry labor in V.O.A.	Subserous petechiae of thoracic organs
90995	3300	Premature separation of placenta	Subserous petechiae of thoracic organs
78148	2050	Accidental hemorrhage	Cerebral hemorrhage, profuse subdural supra- and infratentorial
79131	1650	Maternal toxemia	General edema of fetus. Subserous petechiae of thoracic organs
79481§	3400	Prolonged dry labor in V.O.P.	Syphilis, spirochete positive. Cerebral hemorrhage, moderate subdural infratentorial
79567	2950	Prolonged dry labor in V.O.A.	Complete bilateral laceration of tentorium with moderate hemorrhage
80387	4175	Eclampsia	Cerebral hemorrhage, moderate subdural infratentorial
80611	3200	Premature rupture of membranes	Intrauterine pneumonia
80900	3700	Prolonged dry labor in V.O.A.	Cerebral hemorrhage, moderate subdural supra- and infratentorial

*The cases grouped above the line are those in which the microscopic hemorrhages represented a more adequate cause of death than the other findings.

†At the date of preparation of this paper a baby dying without any voluntary respiratory movements was considered a stillbirth. More recently the New York City Department of Health has altered these standards.

‡Heartbeat for forty minutes following delivery.

§Heartbeat following delivery.

Abbreviations employed in tables: V.O.P., vertex occipitoposterior; V.O.A., vertex occipitoanterior; V.O.Tr., vertex occipitotransverse.

deaths. In 12 cases this finding established an anatomic diagnosis which would otherwise have been inadequate to account for death,* and thereby reduced the number of cases classified as "cause of death undetermined" from 32 per cent to 9 per cent of the series.

Tables III and IV list the 34 cases showing microscopic hemorrhages of the medulla.

*We have not considered subserous petechiae of the thoracic organs, the so-called asphyxial hemorrhages, as adequate anatomic cause of death.

TABLE IV. NEWBORN DEATHS. TWENTY CASES SHOWING MICROSCOPIC HEMORRHAGES IN THE MEDULLA OBLONGATA*

HOSPITAL NUMBER	WEIGHT, GRAMS	AGE		ETIOLOGIC CAUSE OF DEATH	OTHER ANATOMICAL DIAGNOSIS
		DAYS	HR.		
77990	2800		1/3	Flat pelvis	Complete laceration of left tentorium
78423**	3620		2/3	Generally contracted pelvis	
78542	2250		21	Normal labor with asphyxia	Atelectasis. Edema of leptomeninges
79555	2300		7	Prematurity	Edema of leptomeninges
79671	1800	1		Prolapse of funis	Prematurity
78447	2840	4		Prolonged labor in V.O.P.	Hematoma of liver with rupture
91053	3200	2		Syphilis	Bronchopneumonia. Syphilis
78546	1570	3		Prematurity	Bronchopneumonia. Cerebral hemorrhage, right temporal lobe
78561	3050		1	Prolonged dry labor in V.O.Tr.	Cerebral hemorrhage, moderate subdural infratentorial
78755	3450	3		Postnatal cause	Bronchopneumonia
78780	2800		3/4	Congenital disease	General edema of fetus. Edema of larynx
78863	3400		1/3	Prolapse of funis	Cerebral hemorrhage, extensive subdural supratentorial
91182	3950	6		Postnatal cause	Bronchopneumonia
79107	2300		2½	Placenta previa	Cerebral hemorrhage, moderate subdural supra- and infratentorial
79170	2490		1/6	Congenital defect	Renal aplasia
79172	3675		4	Postnatal cause	Pulmonary and mediastinal emphysema
79593	3250	2		Congenital disease	Habitual ieterus gravis
80299	1120		1	Prematurity	Nonviable prematurity
80747	3500	22		Postnatal cause	Erysipelas
80892	3400	2		Nonengagement in flat, contracted pelvis	Extensive cerebral and pulmonary hemorrhages. No evidence of syphilis. (Maternal and cord Wassermann reactions positive)

*The cases grouped above the line are those in which the microscopic hemorrhages represented a more adequate cause of death than the other findings.

**Cesarean section before the onset of labor. Maternal Wassermann reaction strongly positive.

The one child in this series which lived more than six days died on the twenty-second day, of erysipelas. It had microscopie hemorrhages of the medulla which were old rather than recent, however, and recalls Sharpe's³ work on spinal fluid in the newborn.

The importance of small cerebral hemorrhages may be illustrated by two cases. Kirkwood and Myers⁴ have reported a death following inspiratory apnea in a newborn infant in whose brain at autopsy were found several small hemorrhages, the largest measuring 2 by 1.5 by 1.25 mm., just above the level of the olivary bodies. One of us (Hemsath) has performed an autopsy on a full-term infant (No. 83187) dying on the second day who had a spastic paralysis of the left arm and hand. The cerebral lesions were confined to tiny macroscopie and microscopic

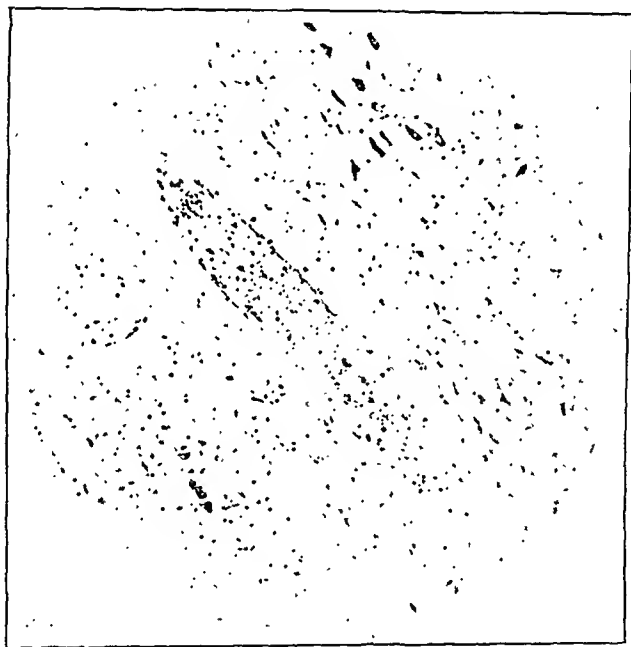


Fig. 3.—(No. 78542.) Note break in wall of vein with ooze of blood into tissue. $\times 110$. Cresylviolet stain.

hemorrhages of the white matter, radiating upward from the lateral ventricle toward the right anterior central gyrus. Thus clinical evidence of damage caused by small cerebral hemorrhages may be apparent though perhaps unrecorded at times.

The etiologic relation of the clinical factors in the production of these hemorrhages has been investigated. A series of 34 cases with hemorrhage and 18 cases without hemorrhage is not sufficiently large to be of much statistical value. Long labors and consequently cases with marked caput succedaneum and cases of occiputoposterior presentation showed a greater incidence of the lesions. Hemorrhages were present in all of the four cases of syphilis, one of which (No. 78423) was delivered by cesarean section before the onset of labor. The factors of primiparity,

age of the mother, type of delivery, whether spontaneous or operative, cord coiled about the neck, and maturity of the child did not apparently bear an etiologic relation to the microscopic hemorrhages. Schwartz explained the hemorrhages upon the basis of the difference in intrauterine pressure and atmospheric pressure which exists with rupture of the membranes and dilatation of the cervix. Voss and others² have reproduced the lesions in animals by vacuum cup experiments. On the basis of this theory the microscopic hemorrhages should not be found in breech presentations, nor were they present in the three such cases in our series. Again this figure is too small for statistical value.

Tentorial lacerations were found in ten deaths and four stillbirths in this series. In eight of this total of fourteen there was sufficient gross



Fig. 4.—(No. 79671.) Capillary with escaped blood into space around vessel. $\times 240$. Cresylviolet stain.

subdural cerebral hemorrhage to account for death. In the other six cases without gross hemorrhage, microscopic hemorrhages were present in the medulla. These findings suggest that microscopic hemorrhages in the vital nerve centers may cause the death of many infants with tentorial lacerations without gross cerebral hemorrhages and replace the speculative theories advanced to explain the mortality in these cases. One of these theories considers that death is due to jamming of the pons into the foramen magnum. If this were the fact one would expect to find a pressure cone of the cerebellum in many of them. In the fourteen cases with tentorial lacerations in this series such evidence was found only once although it was looked for in all cases.

CONCLUSIONS

In microscopic examination of a single or two sections of the medulla oblongata in newborn deaths and stillbirths, there were microscopic hemorrhages in 34 instances (64 per cent) among an unselected series of 53 autopsies. In 12 cases this finding supplied an anatomical cause of death which would otherwise have been lacking.

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307 SECOND AVENUE

240 LONGWOOD AVENUE

OSTEOMALACIA IN PREGNANCY

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OSTEOMALACIA is regarded as a rare disease by the authors of many of our standard textbooks, but if one reads the medical journals from China and India, especially the latter, it is evident that it is a common disease in those countries. It occurs in these places in all stages, but it is particularly the early stage which I wish to emphasize, for I believe that osteomalacia is quite prevalent in this country. The increasing number of reports during the last three years of cases of calcium deficiency and avitaminosis, indicate that marked disturbances of metabolism not only occur but are relatively common if searched for. An excellent review of osteomalacia is found in Hess' book on rickets, and since this chapter, although concise, covers the disease in its entirety, I shall confine this paper to the early symptoms and signs, etiology and treatment as they may be related to pregnancy and the conditions found among our patients.

Workers in various parts of the world have come to the conclusion that there is probably no hard and fast line of demarcation between the so-called "late rickets" and osteomalacia. They believe that the etiology is the same. Extensive studies in China, by Maxwell and Miles, indicate that at least 2 per cent of their women have or have had the disease. The Chinese themselves claim that the incidence may rise as high as 10 per cent of the childbearing women of adult age. In certain districts 2 or 3 per cent of the pregnant women die from this disease. The incidence in India is also very high, for Wilson, Hughes, Stapleton, and Green-Armytage each report large series, Wilson himself reporting a series of 73 cases. Green-Armytage states that

in the course of thirty months in the Eden Hospital in Bengal there were 2,870 maternity cases, and it was necessary to perform 26 craniotomies and 15 cesarean sections for osteomalacic conditions alone. Its frequency in other countries is not known, although DeLee states that about 25 per cent of our women have mild osteomalacia, but he does not give the symptoms nor does he suggest any treatment.

The disease in China is associated more frequently with pregnancy, but in India this is not true. However, the period of greatest frequency of the disease is from puberty to the menopause. Pregnancy and, to a less degree, lactation have been considered among the etiologic factors of the disease; in fact, formerly the ovaries were removed to cure it. There is no doubt that pregnancy plays an important part, but the relationship to puberty is even closer. It was formerly thought that the demand of the fetus for calcium was the cause. However, Hoffström finds that the fetus at twenty-eight weeks contains only 5.38 gm. of calcium and 30.51 gm. at term, but among the cases reported by Huchison and Stapleton, 25 of the 26 occurred previous to the seventh month and 13 at or before the fifth month of pregnancy. Thus the theory that a drain of five grams of calcium would result in osteomalacia is clearly fallacious. The close association with puberty and pregnancy, during which periods we have marked changes among the internal glands, would lead one to think that a glandular defect might be one of the causes. It has been shown that during menstruation the calcium balance becomes negative and the difficulty encountered in maintaining a positive balance in pregnancy lends support to the glandular theory.

In China, Maxwell and Miles find that the disease is limited to the middle class. The wealthy people eat a balanced diet containing meat, eggs, milk, and butter. The diet of the poor is made up of cereals, with a limited quantity of vegetables and, as a rule, no meat, milk, or eggs, and but little animal fat, the oil used for cooking being mainly vegetable. The diet of the middle class is naturally intermediary between these two, but also contains little meat, milk, or fat of animal origin. The women of the poor class are compelled to help their husbands in the fields and thus are exposed to sunlight. The middle class women spend the major portion of their time sitting on the "kang" (a heated platform on which the Chinese sleep), and naturally have little or no exposure to sunshine. The women of the wealthy class spend their time similarly but their deficiency in sunlight is compensated for by their diet.

In addition to the vitamin deficiency there is the character of the diet. Mellanby states that cereals, especially oatmeal, not only do not contain vitamin "D" but do contain some definite anticaleifying substance, which he calls "toxamin." He showed in dogs that on a diet which was deficient in vitamin "D," when other dietary and environmental factors remain the same, doubling the amount of cereal made the rickets distinctly worse.

In India, osteomalacia is most common among the Mohammedans and high-caste Hindus who practice the system of "purdah," in which the women are confined to small dark rooms and during their short periods in the sunshine, which occur, as Scott states, only during a marriage, death, or religious festival, are covered with heavy black veils.

Osteomalacia does not occur among the poor in India whose diet is mainly cereals, because the women have to help in the fields, and as a result of the sunlight have sufficient vitamin "D" so that the "toxamin" from the cereals is neutralized. Thus we have conditions analogous to laboratory experiments. Osteomalacia occurs in China among the middle class whose diet is deficient in animal fat and who have little or no exposure to sunlight. In India, we find it prevalent only in the wealthy, who have fairly well balanced diets but whose customs result in a lack of exposure to sunlight. The common factor found both in China and India is a lack of sunlight or vitamin "D."

In China, the disease is known as the "back and thigh pain." In some cases pain in the lumbar region precedes that in the thighs. It is of an aching character, coming and going, better some days than others, and worse during the winter months than in the summer. The patient may complain of stiffness in the back when getting up and of pain when she tries to hold herself erect; Table I, taken from Wilson,

TABLE I. FIRST SYMPTOMS NOTED BY PATIENT. TOTAL CASES OBSERVED, 135.
(FROM WILSON AND SURIE)

GROUP TO WHICH SYMPTOM REFERRED PAIN	NO. OF CASES
Lumbosacral	39
Pelvic girdle	36
Lower extremities:	
Long bones	31
Joints	18
Ribs	7
Shoulder girdle	4

shows the first symptoms noted by the patient. Green-Armytage finds in some cases that the symptoms are more gastric or intestinal, with great distention and inability to digest food. In some of these the anemia was very great and girdle pains, resembling the gastric crises of locomotor ataxia, were a marked feature. He found that in some cases there was almost complete paralysis below the waistline after child birth, and because they had no pain whatever, the diagnosis was usually that of an organic cord lesion. Under proper treatment, he reports these women walking about within a month. He finds others complaining of numbness or pain in the extremities, and in some this numbness was associated with the sensation of ants creeping over the skin, particularly in the waistline and lateral parts of the thighs. In a few cases, faceache or toothache with neuralgia was the main complaint besides the anemia. He points out that it is all important to remember that typical body changes, due to softening of the bones, are by no means a necessity. In the early case no more than a slight loss of definition in the detail of the bones can be detected. The deformities occurring in the late cases, due to the softening of the bones, require no extensive description.

Another statement which is made is that the serum calcium in osteomalacia is low. This is not true, for in many of the reported cases the serum calcium may be low, normal, or high. Hughes and his coworkers, in 27 cases of osteomalacia, report only three in which the serum calcium was between 7 and 8 mg. per cent. The remainder of his cases had serum calciums varying from 10 to 15.7 mg. per cent, with an average of 13.15. Of their cases, one was early, 12 moderate, and 14 marked. All of the 10 cases reported by Miles had serum calciums varying from 5.0 to 7.5 mg. per cent. Blumgart, Gargill, and

Gilligan report a nine-day period of study of a case of osteomalacia, with eight serum calciums at different periods varying from 10.3 to 11.0 mg. per cent. The explanation of the variation in the serum calcium may be found either in the duration of the disease, that is, a low serum calcium occurring in those cases in which the bones have been markedly depleted of calcium, or in a change in the ratio of free and bound calcium.

Serum phosphate was usually normal, although in some cases, especially those of Maxwell and Miles, low values were found.

The diagnostic aid which is of greatest importance is the calcium balance. This study is time consuming and requires a completely equipped laboratory, and, as a result, few studies are available. The reported cases of calcium and phosphorous metabolism in pregnancy, including two unreported cases of our own, indicate that the minimal intake in pregnancy for each element should be 1.5 and 2.0 gm., respectively. Hunscher has shown that if large amounts of milk are secreted it is impossible to maintain a positive calcium balance by diet alone.

In osteomalacia the calcium balance is usually negative although certain patients at times may show a positive balance. Numerous factors enter into this phenomenon, such as the acidity of the diet, exposure to sunlight, ingestion of fats, etc. Maxwell and Miles, in a seven-day study of calcium and phosphorous metabolism in four pregnant Chinese women, report that three had a negative calcium balance, showing a daily loss which varied from 0.05 to 0.84 gm., and that one had a positive balance of 0.44 gm. The average daily intake was approximately 0.5 gm., and the phosphorous metabolism was positive in all. The addition to the diet in three cases of 24 c.c. of cod liver oil daily was sufficient to produce a positive balance. Olive oil and calcium lactate in one case did not produce a positive balance. Blumgart, Gargill, and Gilligan, in a case of osteomalacia, found in a nine-day study period that there was a daily retention of 1.46 gm. of calcium.

Hartley, in a recent report, ascribes the pains, insomnia, and paresthesia occurring in pregnancy, as due to a disturbance of calcium metabolism, producing in the individual a tetanoid state.*

We have had a number of women complaining of cramps in the legs, pain in the back, abdomen and symphysis, or difficulty in walking, the latter being associated at times with marked mobility of the symphysis, and we have treated these patients in various ways, either considering the cramps as due to pressure of the head, neuritis, or what not. It is noteworthy that attention has been given on our service to these symptoms only since 1921. They undoubtedly occurred before but were not thought of sufficient interest to diagnose.

*I believe the symptoms in his cases are those of an early osteomalacia.

TABLE II

CASE NO.	AGE	COLOR	G.	LAST PERIOD	SYMPTOMS	DATE OF DELIVERY	DURATION OF REPRODUCTIVE PERIOD YEAR	INCOME PER MONTH \$	NUMBER IN FAMILY
1-2756	29	W	7	1-15-16	Pain in all joints for 4 yr. Kyphosis, scoliosis, multiple fractures		9		
2-3778	22	W	2	None	Pain in symphysis 6 days postpartum	11-29-21	1½	Private Patient	3
3-4401	31	C	5	1-10-22	Tenderness over symphysis 4 days postpartum	11-3-22	11	60	7
4-4468	26	C	2	3-7-22	Pain in symphysis 3 days postpartum	11-25-22	1½	150	3
4-a			4	7-17-25	1-7-26 Walks with difficulty	4-2-26	4	111	5
5-5988	26	C	9	3-25	At 2 mo. legs became weak and numb. Unable to walk for 4 wk. Same trouble with previous pregnancy	12-9-25	10		7
6-6295	29	C	3	?	At 2 mo. pain in symphysis and difficulty in walking. Similar trouble in previous pregnancies	3-13-25	10	100	4
7-6998	24	C	3	4-15-26	Pain in lower abdomen for 1 yr. Tender symphysis since 12-2-25	1-31-27	4	40	5
8-9679	26	W	4	6-18-27	Pain on moving 3 days postpartum	3-15-27	8	160	6
9-3687	22	W	4	3-1-28	Pain on walking. Sep. symphysis 6 wk. antepartem	12-19-28	4	150	5
9-a	23	W	5	9-15-29	Pain in walking. Sep. symphysis 6 wk. antepartem	6-7-30	6	150	6
10-4587	31	C	4	3-1-29	Pain in symphysis 1-15-29	3-5-30	8	90	7
11-6911	32	C	4	3-1-29	Pain in back at 8 mo.	12-13-29	12	100	5
12-3862	32	C	8	5-1-28	Unable to walk Separated symphysis	1-20-29 4-19-30	11 12	60 60	7 8
12-a	33		9	8-8-29	"				

Table II lists a series of 15 observations in 12 patients. Pertinent data are given. The occurrence of all of the cases between the ages of twenty-two and thirty-two is due to two factors. One is that this is the period of greatest productivity and second the income is naturally lowest during this period. Eight were among the colored, again indicating first a financial factor and second less ultraviolet rays could be absorbed because of the black skin. Although all of the patients were multiparae, the principal factor was the short interval between babies. In the six ob-

servations on three patients the interval was approximately a year. Four patients first noted symptoms from three to six days postpartum. During this period lactation begins and the symptoms are presumably due to the sudden and great drain on the body for the calcium and phosphorous in the milk. The remainder, as a rule, tended to begin in the last three months when the demand for calcium and phosphorous would be greatest. All of the patients had pain in the symphysis and frequently some difficulty in walking. Usually there was more movement than normal in the symphysis, but this mobility, although decreased, is still present in three cases seven to fifteen months after delivery. However, the pain and difficulty in walking has disappeared.

In addition, there have been nine patients in the past two years who have been completely relieved of symptoms following the administration of cod liver oil; these were all ambulatory.

The relaxation of the symphysis, in my opinion, is not merely an exaggeration of the normal increase associated with pregnancy, nor is it a sign of reversion. (Relaxation of the symphysis and, in some cases, a complete absorption occurs in certain species of animals during pregnancy. In fact, the injection of serum into these animals from a pregnant woman will produce this change.—Todd, Hisaw.) We believe that the relaxation is definitely pathologic, and although relaxation of the joints has not been described in osteomalacia, it is worth noting that Barr and Bulger describe a ease of parathyroid tumor in which a slightly increased mobility of the joints in childhood, as a result of the loss of calcium, became so marked that the patient was able to go to sleep with her head on her ankles.

CASE 1, as the data on the chart indicate, was undoubtedly a case of osteomalacia. Cases 2 and 5 were the only ones in which the x-ray was able to show signs of resorption of bone. Cases 6 and 11 exhibited the waddle in their gait, characteristic of osteomalacia. Abstracts of the histories of typical cases are as follows:

CASE 2.—White, twenty-two years old, a private patient (second pregnancy in 19 months) was admitted November 28, 1921, and delivered on the following day by an easy low forceps. On December 5, she complained of intense pain in the symphysis. Upon examination a marked tenderness along the ascending rami of the pubis was noted. X-ray report: Anterior portion of either ischium and the symphysis present diminished density, suggestive of changes in the bone. Patient was relieved by a tight binder and was discharged on December 31.

CASE 4.—Colored, twenty-six years old, was delivered spontaneously on November 25, 1922, of a 2,000 gm. living baby. On November 28, she complained of acute pain in the symphysis and interference of movements; strapping gave relief. She had had two pregnancies in eighteen months. On January 7, 1926, when twenty-six weeks pregnant, she was again admitted because of difficulty in walking; marked mobility of the symphysis was present. Strapping gave relief. She delivered on April 2, 1926, and on discharge was well. She had had four babies in five years.

CASE 5.—Twenty-five years old, colored, gravida eight, seven weeks postpartum, was admitted on August 28, 1924, complaining of pain and swelling of feet. She had

been delivered at home by a colored doctor and had had a curettage when one week postpartum. She had been delirious and unconscious for four days, was in bed three weeks, and has since been incapacitated. On admission the pelvic examination was negative except for marked tenderness of the sacrum on the right. Neurologic examination: K.K.'s and A.J.'s not obtained. The patient was examined by numerous medical men and each one had a different diagnosis. She was given intensive anti-syphilitic treatment, and eventually discharged as improved. Was readmitted on obstetric service December 28, 1925, as a gravida nine with five living children. Unable to walk for four weeks. Last menstrual period March, 1925. Has been vomiting since November. Wassermann negative December 28, 1925; Kahn three-plus. Delivery of 2,500 gm. baby December 29, 1925. My note was as follows: Marked malnutrition together with pain, etc., suggestive of osteomalacia. Up to four years ago the patient lived in the country and the diet contained large amounts of chicken, cream, milk, fresh vegetables, etc. Patient weighed 160 pounds. She had had nine pregnancies in ten years. There are now six children living. The diet during this pregnancy did not contain much, if any, of the above articles. She had pains in the soles of her feet with some radiation upward before the baby was born in 1924, which were increased markedly after the last delivery, but she had recovered entirely at the time of discharge from the hospital. From Thanksgiving day, she was in bed and was waited on by her children. On some days she had received little, if anything to eat. During the last two pregnancies she had no desire to eat. Her reason for going to bed was "false pains." She states that whenever she got out of bed she would have a burning sensation in the soles of her feet and then pain in the thighs and back, followed by "false labor pains." Since delivery she feels much better. Serum was calcium 8 mg. per cent. February 3, 1926, elastic tissue and tubercle bacilli found in sputum. Patient sterilized on January 22, 1926. X-ray of pelvis demonstrated questionable rarefaction of the descending ramus of the pubis on the left. Also a questionable rarefaction of the extremities of the bones of both legs and both upper extremities. Weight on admission 106. Weight on discharge 97½. She was given cod liver oil and calcium lactate during the hospital period. Was normal at discharge except for underweight. She was able to do all of her housework for eight months. She died February 22, 1927, of influenza.

CASE 6.—Colored, twenty-nine years old, was admitted on December 16, 1924, for diagnosis. She was approximately twenty-eight weeks pregnant. She complained of pain in the lower abdomen, lower back, right hip and right leg, and a weakness and dragging of the right leg. Has had two children in sixteen years. With each pregnancy she had the same disturbances such as she now has. About two months after the beginning of each pregnancy, she stated that she would have pain in the lower abdomen, like needles sticking her, then difficulty in walking and cramps in her legs. After delivery all of the symptoms subsided. Examination: Hyperesthesia over the back on the right side below the ninth vertebra. Definite weakness in the right leg and movements of leg suggest some spasticity. She had a marked and persistent lordosis.

Dr. Schwarz's note: "Patient sent into hospital on account of peculiar gait, walks with legs slightly abducted and stiff at knees. X-ray films of spine and pelvis are negative. Patient is of very low mentality—complains of pain over lower spine and pelvis. States that this has never been present before this pregnancy, but has developed particularly in the past two months. Patient apparently has not been eating proper food and has probably been quite inactive." She was delivered in March and then placed in the City Sanatorium because of her mental deficiency. On May 6, 1931, the patient was seen at the St. Louis City Sanatorium for the Insane. Weight 163 pounds. Still had marked lordosis with very prominent buttocks and the peculiar walk.

CASE 11.—Colored, thirty-two years old, was admitted on November 26, 1929, because of pain in the lower abdomen and back when standing or walking. This is her fourth pregnancy in twelve years. She has had the pain since October 1, and states that she had not been out of the house for about two months. The pain was so acute at first that she remained in bed. Her calculated date of delivery was December 8, 1929. In a period of four months she had gained only six pounds. Examination: Negative except for the marked mobility of the symphysis. X-ray: The right pubic bone was at a slightly lower level than its fellow, but the width between the bones was within the normal limits. She was placed on a diet containing 125 gm. protein, 200 gm. fat, and 250 gm. carbohydrates. The diet was rich in vitamins and, in addition, 4 c.c. of cod liver oil were given three times daily. She was encouraged to move about and one week later the pain had disappeared and she was able to walk without difficulty. On December 13, she was delivered of a 2,300 gm. living baby. On September 25, 1930, she weighed 170 pounds and has had no pain since leaving the hospital. Increased mobility was still palpable.

CASE 12.—Colored, thirty-two years old, was admitted to the hospital because of pain in the pelvis and back. She stated that about three months ago when on her way to the clinic she suddenly fell. Since then, she has had no control over her legs, and any movement causes intense pain. In 1924, the patient first noticed difficulty in walking when she was thirty-eight weeks pregnant. This had followed a fall and she had been told that she had a fracture of the pelvis. Examination was negative except for extreme mobility of the symphysial joint. The patient was strapped, but this did not relieve her, and she was kept in bed until her delivery (a period of eight weeks). At the time of discharge she was still unable to walk and did not regain complete control of her legs until the baby was two months old.

Patient was readmitted to hospital on March 8, 1930, for similar complaint. She was approximately thirty weeks pregnant and again without warning had fallen on

TABLE III

MARCH 1930	PERIOD OF STUDY DAYS	CALCIUM GM.		PHOSPHORUS GM.	
		INTAKE	OUTPUT	INTAKE	OUTPUT
14 - 23	10	33.53	16.57	25.88	11.98
24 - Apr. 2	10	31.67	16.46	21.76	14.53
3 - 18	16	54.29	30.59	38.14	22.14
Total		119.49	63.62	85.78	48.65
<i>Av. per day</i>		3.32	1.77	2.38	1.35
Delivery:					
19 - 28	10	34.57	20.70	24.33	12.93
<i>Av. per day</i>		3.46	2.07	2.43	1.29
Operation:					
May 4 - 13	10	32.3	18.27	21.72	9.72
<i>Av. per day</i>		3.23	1.83	2.17	.97

the way to the clinic. Examination again was negative except for movement in the symphysis and many carious teeth which showed a marked deterioration since the previous examination. The patient was asked to remain out of bed as much as possible. Calcium and phosphorous metabolism were studied with the patient on a diet containing 150 gm. of protein, 275 gm. of fat, and 320 gm. carbohydrates, together with 5 gm. of calcium gluconate three times daily. Viosterol (10 drops three times daily) and plenty of fresh fruit, vegetables, and cream were given for their vitamin content. After a minor gastric upset, due to the marked increase in food, the patient was able to take the diet which gave 4,400 calories, without much trouble. The pain did not subside completely, but the patient was able to walk daily and had no more falls. She was able to walk to the delivery room on the nineteenth of April when she delivered a 2,500 gm. living fetus. Lactation was stopped to prevent loss of calcium in the milk. She was sterilized by a tubal resection and ligation on April 30. She had had nine children in a period of 12 years. Her diet consisted, as a rule, of one meal per day which was a stew containing vegetables and meal. There was little or no meat, fresh vegetables, or fruit, and no butter or milk. All of the previous babies had severe rickets. The patient has been followed up to the present and has had no difficulty in walking and has had no pain. Palpation of the joint showed that it was still movable, but apparently to a less degree. She has been seen at periodic intervals and has lost weight steadily. In June, 1931, her weight was 95 pounds. This loss is due to improper and insufficient food.

The metabolism studies were made over a period of sixty-one days and the data for calcium and phosphorous are given in Table III. Analyses of urine and feces were made daily, but have been grouped into periods of from five to ten days each. During the sixty-one days of diet control, the average daily intake of calcium, excluding the postoperative period of five days, was 3.32 gm., and the average output was 1.83 gm., giving a daily positive balance of 1.49 gm. In the entire period 87 gm. of calcium were retained. As the total calcium content of the fetus when born is stated by Hoffström as 30.51 gm., it is evident that the patient's calcium stores had been markedly depleted. The average phosphorous intake was 2.63 gm. per day and the output 1.34 gm., giving a daily positive balance of 1.29 gm. During the period of study, 60 gm. of phosphorous were retained. These tremendous retentions indicate that the patient had been starved for these substances and the marked assimilation for calcium warrants the diagnosis of osteomalacia.

The serum calcium and phosphorous on admission were 10.8 and 3.57 mg. per cent. A serum calcium on March 12, 1930, was 8.5 mg. per cent. As a result of the viosterol, the calcium rose to a maximum of 14.2 and the phosphorous to 5.0 mg. per cent. These dropped rapidly and three weeks after discharge they were 10.6 and 2.63 mg. per cent, respectively, and have remained normal until March 18, 1931, and June 3, 1931, when the calcium was 8.9 and 8.4 mg. per cent, respectively.

The diagnosis of early osteomalacia should be based on the symptoms and not on the x-ray. There are approximately 1,500 gm. of calcium in the skeleton, and it is evident that the negative calcium balance must be of long duration before bony changes can be detected with the x-ray. Furthermore, it requires a long time to replace this calcium. Bulger has recently studied a case of parathyroid tumor which, after operation, retained as much as 2.0 gm. of calcium per day in some of the periods, and yet it required a period of seven weeks to show x-ray changes. In osteomalacia where the disease presumably is still active, the repair process is much slower.

One other phase of osteomalacia which should be considered is the effect on the baby. Green-Armytage states that in osteomalacia the fetus also suffers from a lack of calcium and that "when born it is skinny and its long bones are poor in ostrin and elondrin, while the epiphyseal zone of calcification is irregular. If the physician does not realize this, the infant may die from calcium and vitamin deficiency." Maxwell reports two cases of fetal rickets. One baby died on the fourth day and at the postmortem there was definite evidence of rickets, while the other diagnosis was based on the x-ray evidence.

The development of the teeth of infants begins at the sixth or seventh month of fetal life, with the deposition of lime salts in the crowns of the temporary teeth. At birth all of the temporary teeth are calcified and the crowns of the permanent first molars are partially calcified; hence it might be expected that the diet of the mother during pregnancy would exert an influence upon the development of the teeth. Mellanby found on diets deficient in the calcifying vitamin the dentine of the deciduous teeth of the offspring often contains small interglobular spaces and the enamel might be defectively calcified, indicating that the mothers had been unable to supply from their own bodies a sufficiency of the factors necessary to insure perfect calcification. Toverud obtained similar results in rats.

SUMMARY

Osteomalacia must have an earlier stage than the one which is characterized by marked deformities of the bones. The diagnosis should be made on the symptoms and evidence of calcium deficiency, as determined either by metabolism studies or by an analysis of the diet. The serum calcium need not be subnormal to warrant a diagnosis of osteomalacia, nor do the bones in the early stage show any signs of absorption perceptible to the x-ray.

There is a definite association between pregnancies at short intervals, insufficient or improper diet and the occurrence of pain in the symphysis, back and thighs, and difficulty in walking.

The diet of the pregnant woman should be carefully supervised in that it should contain as a minimum, 1.5 gm. of calcium and 2.0 gm. of phosphorus, sufficient butter and milk, and fresh vegetables and fruits for the vitamin content. In many patients, especially where there is an economic problem, the diet should be supplemented with calcium and cod liver oil. This applies in particular to the negro race. The result will be that the women will have less disability because of calcium deficiency and less decay and softening of teeth. The baby will be started with its proper store of calcium and phosphorus and will be less liable to develop rickets. Furthermore, since the deciduous teeth are formed in utero, they will have their proper composition and be less likely to decay.

METHODS

The diets were weighed and any unconsumed portions were again weighed by the same dietitian. The calcium and phosphorous intake was calculated from the analysis of food collected from the literature by Sherman. Three standard diets were made up and given to the patient on different days. Each contained 4,500 calories, but the average amount consumed was equivalent to about 3,500 calories.

Each diet was thoroughly ground up and cooked with frequent additions of water until a homogeneous mass was produced. The volume was then determined and aliquots taken for analysis. The results are listed in Table IV.

TABLE IV

	CALCIUM		PHOSPHOROUS	
	CALCULATED	DETERMINED	CALCULATED	DETERMINED
I	2.091	2.7	2.904	2.15
II	2.605	2.72	3.356	4.10
III	2.282	2.18	3.071	4.52

The stool and urine collections were under the supervision of the head nurse and a technician. The calcium in the urine was determined by the method of Shohl and Pedley, and that of the feces by the method of Corley and Dennis. Aliquots of the latter were used for total phosphorous. The total phosphorous of the urine was determined by the uranium acetate method. Constituents of serum and blood were determined by the usual accepted methods.

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MENORRHAGIA DUE TO HYPOTHYROIDISM

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IT IS universally conceded that the function of the thyroid gland is intimately connected with that of the ovaries, but the exact relationship is a matter of dispute. The clinical application of such knowledge is likewise confusing, and literature on the subject is a mass of conflicting data.

The syndrome of hypothyroidism is quite generally assumed to include scanty menstruation, or even amenorrhea. Craddock,¹ Gregory,² Higgins,³ Sanderson,⁴ and others mention the efficiency of thyroid substance in the treatment of certain cases of diminished menstrual flow. Marine⁵ states that "menstruation is often irregular, or even ceases, but well defined cases (of hypothyroidism) may have regular menses." He further says that "menorrhagia of varying degree is an important symptom and some patients date the onset of their disease from excessive bleeding." Graves⁶ ascribes both amenorrhea and menorrhagia to myxedema and says that administration of thyroid substance may benefit equally the two conditions.

Gardiner-Hill and Smith,⁷ reporting 59 cases of myxedema, concluded that amenorrhea was not a symptom of hypothyroidism but that menorrhagia was usual in the disease. Twenty-three of their 59 patients were observed before the menopause; of these, 18 had menorrhagia while 4 menstruated normally, and one not at all. These authors believed that menorrhagia, occurring during the menopause and not attributable to local causes, is significant of hypothyroidism. They stated that "myxedema is a common sequel to the artificial menopause when the latter has been induced for menorrhagia" (in those patients with no apparent pelvic pathology).

Lisser⁸ never encountered amenorrhea as a symptom of hypothyroidism, stating that "the interval between periods is apt to become irregular, sometimes short and sometimes long, but the flow is very copious and may continue for a week to a month or more. The administration of thyroid corrects this excessive hemorrhage and restores the normal periodicity." He described "adolescent menorrhagia of hypothyroid origin" as a clinical entity in which there is an early development of the secondary sexual characteristics accompanied by early onset of menstruation which becomes profuse and prolonged. Lisser concluded that "in the absence of local causes in the pelvis, an early onset of menstruation together with long and continued bleeding is suggestive of hypothyroidism."

The following cases are selected to illustrate the menorrhagia due to hypothyroidism and to demonstrate the efficiency of thyroid substance in correcting the disorder.

CASE 1.—An eighteen-year-old girl on September 11, 1930, stated that since the onset of menstruation at the age of twelve, the flow had been very profuse, frequently lasting over periods of three months. Intermenstrual intervals had seldom approached two weeks in length and weakness was a constant complaint. Rest in bed on the advice of physicians had not retarded the flow. Radiation, and finally, operation had been advised and refused. For the past three months the flow had been constant and excessive. She also complained of sluggishness, fatigue, and sensitivity to cold.

Examination revealed a normal height-weight ratio and a marked secondary anemia. From rectal palpation the pelvic organs appeared to be normal. The breasts, external genitalia, and hair distribution suggested no endocrine dysfunction.

The basal metabolic rate could not be determined because of the highly apprehensive state of the patient. There was a marked hypochromatic anemia, the erythrocyte count being 2,960,000 and the hemoglobin 45 per cent (Dare).

She was given copper and iron and one grain of thyroid extract daily. By October 1 the dosage of the gland had been increased to 6 grains daily. The amount of flow gradually diminished, and on October 6, twenty-four days after institution of treatment, her bleeding ceased altogether. Subsequent periods (October 24-29, November 17-21, December 15-19, 1930, and January 13-18, 1931) were normal in duration and amount of flow.

On October 16 the erythrocytes numbered 3,800,000 and the hemoglobin had increased to 70 per cent. Three weeks later there were 4,090,000 red cells and the hemoglobin was estimated to be 80 per cent.

Thyroid substance was omitted on January 20 and the subsequent period in February was markedly increased in amount. The patient also complained of returning fatigue and sluggishness, so the use of the gland was resumed.

It may be suggested with some justification that this case was one of chlorosis rather than hypothyroidism and that relief from menorrhagia was due to the coincident administration of copper and iron and not to thyroid gland therapy. The usual menstrual tendency in chlorosis is toward amenorrhea, however, and it is to be noted that the bleeding in this case ceased before appreciable improvement in the blood picture. Moreover, there was no evidence of thyrointoxication in spite of large doses of the gland.

CASE 2.—A woman, thirty-eight years of age, complained of profuse menstruation which usually lasted from ten to fourteen days, accompanied by severe headache. She was markedly sensitive to cold and suffered fatigue on slight exertion.

The thyroid gland was slightly and uniformly enlarged and the skin was rather dry. The blood pressure was normal but the pulse rate was 92 per minute. The pelvic organs presented no abnormality.

Blood examination disclosed a moderate secondary anemia. The basal metabolic rate was minus 19.

On the administration of 2 grains of thyroid extract daily the menstrual period was reduced to four days and the amount of flow became normal. Overconfident, the patient used the gland only at irregular intervals during the next month and the subsequent period continued profusely for ten days. On resumption of the original dosage of thyroid extract, the flow again became normal and has remained so up to the present time, eight months after the institution of treatment. The use of the gland had no effect on the basal metabolism but headache, weakness and chilliness were relieved.

CASE 3.—A woman, thirty-eight years of age, stated that since its onset at the age of twelve, menstruation habitually recurred at intervals of twenty-one days and lasted profusely for seven days. The flow was reestablished six weeks after the birth of each of three children. For the past six months the intermenstrual intervals had been only fourteen to eighteen days, and the amount of bleeding had steadily increased. She complained of unusual sensitiveness to cold, easy fatigue, and the persistence of obesity in spite of self-imposed dietary restrictions.

Examination showed excessive but uniformly distributed fat. The skin was dry and the temperature was subnormal. There was no pelvic pathology to explain the menorrhagia. The basal metabolic rate was minus 5.

One grain of thyroid extract was administered daily with no effect upon the succeeding period. After increasing the dose to three grains daily for the following month the intermenstrual interval increased to twenty-nine days and the amount of

flow was appreciably diminished. With the continuation of this dosage, five subsequent periods were normal, and the symptoms of hypothyroidism were relieved. There was a substantial decrease in weight with no dietary restriction.

CASE 4.—A woman at the age of forty-seven had a profuse menstrual flow lasting five weeks. It recurred two weeks later and continued constantly during the next four weeks, at the end of which time she came under observation. Except for a period of amenorrhea many years previously the past menstrual history was not unusual.

For many years she had experienced vague, dull bodily pains which she attributed to neuritis. She was tired most of the time and felt incapable of her work which was not unduly exacting.

Examination revealed nothing of interest except a slight obesity with typical cuffing of fat about the wrists and ankles, a subnormal temperature, and a yellowish appearance of the skin.

After receiving three grains of thyroid substance for a week the flow ceased. Continuation of this regimen resulted in a complete return to normal periodicity and amount of menstrual flow.

CASE 5.—A woman, aged twenty-four years, stated that since the onset of her menses at the age of eleven, they had been profuse, occurring every twenty-one to twenty-five days and usually lasting seven days. The period was accompanied by pain and gastrointestinal disturbance. She had a very poor appetite and complained of loss of strength and energy. She experienced chilliness even during the summer months.

The patient was undernourished and anemic. Both temperature and blood pressure were subnormal. The basal metabolic rate was estimated to be minus 22.

Upon the administration of thyroid extract with a final daily dosage of six grains, the periods became normal in duration and amount of flow, recurring at twenty-five-day intervals. After five months she felt more energetic and was definitely less sensitive to cold.

CASE 6.—A woman, aged fifty-five years came under observation in September, 1929, complaining of attacks of headache, nausea, and vomiting. She felt weak and suffered from vague neuralgic pains. Radium had been used ten years previously to control intractable menorrhagia of five years' duration, and the patient dated the onset of her present illness from that time. The menses had begun at the age of twelve and had been normal until the age of thirty. At that time she had a painful swelling at the base of the neck and was ill with fever for several days. This was apparently acute thyroiditis for pus was obtained by incision into the suprasternal space. After the acute inflammation subsided she gained weight rapidly, became easily fatigued, and was markedly sensitive to cold. At the time her symptoms were attributed to the anemia of menorrhagia, but cessation of the flow was not followed by their improvement.

The patient was an obese individual with puffy eyelids, dry skin, and slight cuffing of fat about the wrists and ankles. The systolic blood pressure was 200, and the diastolic, 120 mm. of mercury. The retinal vessels were markedly sclerosed and renal function was definitely impaired. The basal metabolic rate was plus 5.

She was placed upon a reducing diet and was given vasomotor sedatives in an effort to stimulate kidney function and lower the blood pressure. She appeared to improve under this regimen but temporarily disappeared from observation.

When seen again one year later, her renal impairment seemed definitely worse, the urine being low in specific gravity and containing albumin. She had been vomiting for several days and was moderately edematous.

She responded well to the administration of glucose and fluids and the vomiting soon ceased. In spite of the apparently normal basal metabolic rate, thyroid extract in small dosage was begun. This regimen finally included six grains of the gland

daily and has been continued for four months. She is markedly improved, has lost much weight, and is maintaining a blood pressure below 140 mm. Hg. systolic, and below 100, diastolic.

This patient is undoubtedly one of the type described by Gardiner-Hill and Smith, in whom menorrhagia of the climateric was due to myxedema, and for which the use of radium was proved to be irrational in the light of later developments in the case.

COMMENT

The purpose of this discussion is to direct attention to the occurrence of a phenomenon which has been not infrequently reported, but which apparently has not been sufficiently emphasized. While it is not within the scope of this article to deal with the entire problem of the etiology of menorrhagia, it is to be understood that all patients presenting themselves with the complaint of excessive bleeding, especially at the time of the menopause, should receive a thorough and exhaustive examination to detect any underlying pelvic pathology. If necessary, curettement may be performed to secure material for histologic study, for only by such means may insidious malignant growths be successfully combated.

TABLE I. SYMPTOMS OF HYPOTHYROIDISM OCCURRING IN SIX CASES OF MENORRHAGIA

CASE NO.	WEAKNESS	SENSITIVITY		NUTRITION	NEURALGIC PAINS	BASAL METABOLIC RATE	
		TO COLD	DRY SKIN				
1	moderate	moderate	moderate	normal	none	minus	2
2	moderate	marked	moderate	normal	none	minus	19
3	moderate	marked	slight	obese	moderate	minus	5
4	marked	marked	moderate	obese	marked	minus	18
5	marked	moderate	slight	poor	mild	minus	22
6	marked	marked	marked	obese	marked	plus	5

There is much evidence in the cases reported herein to justify the assumption that menorrhagia is often due to deficient function of the thyroid gland. The uniform enlargement of the uterus, frequently attributed to small fibromyomas, may be in certain cases only the result of congestion incident to excessive menstrual stimulation. In the determination of thyroid gland insufficiency, the evidence furnished by the estimation of the basal metabolic rate, subject as it is to various influences, is unreliable. A therapeutic test with the administration of thyroid extract should precede the use of more radical measures in obscure cases of menorrhagia. The patient in Case 6 of this series perhaps could have been spared the expense of radiation and the resulting discomfort of artificial menopause had this suggestion been carried out.

It will be noted that in three cases the basal metabolic rate was estimated to be normal. In spite of this negative finding, which has been overemphasized in the interpretation of clinical data, there were, in ad-

dition to menorrhagia, other symptoms indicative of hypothyroidism. Furthermore, the administration to these patients of thyroid substance in dosage toxic to normal individuals was followed by amelioration of symptoms. It can not be denied that the most reliable index of hypothyroidism is the ability of the individual to utilize substituted gland material for her benefit.

SUMMARY

Excessive bleeding is the menstrual disturbance most frequently associated with hypothyroidism, amenorrhea rarely, if ever, occurring when the thyroid gland alone is deficient in function. In patients of any age whose menorrhagia can not be attributed to pelvic pathology, a therapeutic test with thyroid gland administration should be given before more radical measures are instituted.

Definite hypothyroidism may occur in the presence of an apparently normal basal metabolism. The importance of the basal metabolic rate has been overemphasized in the diagnosis of variation in thyroid gland activity; disturbance of metabolism should be accepted only as one evidence of disease. Clinical acumen remains the principal agent of the physician in the detection of thyroid disturbances and can not be supplanted by any laboratory procedure. The response of the symptoms of hypothyroidism, including menorrhagia, to substitution therapy furnishes the most reliable evidence that the thyroid gland is deficient in function.

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Meyer, Lackner, and Schochet: Paroxysmal Tachycardia in Pregnancy. J. A. M. A. 94: 1901, 1930.

Report of two cases of tachycardia associated with pregnancy. The one showed definite evidence of early decompensation and symptoms pointing to mitral stenosis during an attack in the sixth month of pregnancy. It was deemed inadvisable to submit her to the test of labor and a cesarean section was done at term.

The other patient had been observed at various times in the hospital with attacks of tachycardia lasting from three hours to two days. Two days postpartum another severe attack occurred, with a pulse rate up to 200 for eight days.

The recognition of paroxysmal tachycardia in pregnancy should put the obstetrician on guard as to its possible recurrence during labor. The decision as to time and method of terminating pregnancy is to be determined in each case by evaluating as far as possible the condition of the myocardium, duration, and severity of previous attacks.

THE INDUCTION OF LABOR AT TERM*

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(*From The Hospital of the Good Samaritan*)

THE title I have chosen is more comprehensive than my report deserves. Nothing will be said of packs, bags, bougies, or of any other method of induction than the one I have employed successfully during the past four years. This method consists in the rupture of the membranes and the intranasal application of pituitary extract after the preliminary administration of castor oil and quinine. Each of these steps is a familiar procedure, used independently to bring on labor. Each proves quite satisfactory, when effective; but one cannot predict when it will be so. On the other hand the three procedures employed in succession may confidently be relied upon. This combination has not failed in my experience, but to attain success in two cases the treatment was repeated within twenty-four hours.

In September, 1927, I found it expedient to induce labor in a multipara, normal in all respects. Accordingly she entered the hospital at a specified time and took the customary dose of oil and quinine. After the lapse of four hours labor had not begun and I sought to improve the chances of success by applying pituitary extract to the nasal mucosa employing Hofbauer's¹ technic. The extract excited rhythmic uterine contractions at intervals of five minutes but their effect upon the cervix was slight. Consequently, I decided to rupture the membranes. This was accomplished readily, for the cervical canal admitted two fingers before any attempt at induction was made. After the membranes had been ruptured and another pledget of cotton saturated with pituitary extract had been inserted into the nostril, the clinical picture changed very promptly. Vigorous uterine contractions began and recurred at two-minute intervals. The cervix dilated rapidly. The short second stage ended spontaneously. Less than two hours passed from the rupturing of the membranes until the infant was born.

Similar experiences soon convinced me that the rupture of the membranes was an essential step in the induction though alone it was insufficient to inaugurate the mechanism of cervical dilatation with desirable promptness. This procedure, I have since learned, was advocated by Thomas Denman² in his textbook on Midwifery published in 1802.

Delay often follows when spontaneous rupture of the membranes becomes the initial symptom of the onset of labor. Days, a week, or even a longer period will pass occasionally before uterine contractions begin. During this interval an infection dangerous to the mother and at times

*Read before the Los Angeles Obstetrical Society, April, 1931.

fatal to the child³ may gain entrance into the uterine cavity. Therefore, the likelihood of such a complication must be taken into account when the membranes are ruptured deliberately to bring on labor. If a long delay attends the procedure, it is open to serious objection. To avoid that difficulty, oil and quinine are given as a preliminary measure and pituitary extract is administered later.

What intervals of time should be allowed to elapse between the various steps of the method? Experience alone can answer this question. With no field of study other than private practice it has required nearly four years to make the number of observations requisite for sound conclusions. Meanwhile, Doctor Delbert Jackson⁴ of Boston anticipated my report. Omitting the initial dose of oil and quinine, Jackson recommended the rupture of the membranes, followed within twenty to thirty minutes by the hypodermic administration of two to five minims of pituitary extract. Eighty-seven cases comprising 26 primiparae and 61 multiparae were reported. There was no maternal mortality but ten fetal deaths occurred in the series. Five of the infants were macerated, four others premature and one an anencephalic monster.

The method I have used was employed in 132 cases of which 100 were multiparae and 32 primiparae. There have been no maternal deaths. One baby was stillborn and this result, I feel, should be charged against the method as no other cause of death could be proved. In this instance the mother, a primipara, twenty-eight years of age, was eleven days beyond her expected date. The head was deeply engaged. The heart sounds were audible during the early part of the first stage but could not be heard when the cervix was approximately two-thirds dilated. An additional two hours were required before full dilatation was reached. Delivery was effected by forceps. There was a coil of cord tightly wound about the neck and the body was covered with freshly passed meconium leaving no doubt that death had occurred recently. While compression may have shut off the umbilical circulation, it seems wiser to attribute the fatality to vigorous uterine contractions which impaired the placental circulation. This attitude may serve to prevent repetition of the accident. Indeed, the watchfulness inspired by this fatality has probably prevented two or three similar accidents already, for as a precautionary measure the cotton is now withdrawn more promptly whenever the contractions are violent. The opportunity thus provided to control its absorption is precisely what recommends the intranasal administration of pituitary extract.

From first to last the steps in this method of bringing on labor follow familiar lines. The dose of two ounces of castor oil and ten grains of quinine given primarily has never had an injurious effect upon the fetus and only in one instance caused discomfort to the mother. The sensitiveness of this individual to quinine was manifested by a typical rash which disappeared within forty-eight hours. Another patient, aware of this

idiosyncrasy, warned us; and the drug was not given, without lessening the efficiency of the method. In view of this result we are curious to know whether quinine may always be omitted. As yet I have not sought the answer, because I wished to establish first the dependability of the method originally devised and to become familiar with the clinical phenomena which followed its use.

Four hours after oil and quinine are given the membranes are ruptured. This interval of time was chosen because formerly when depending upon these drugs alone for the induction of labor, a method which failed in one-third of the cases, I noticed that effective uterine contractions frequently began at the end of four hours, seldom earlier. It is certain that a longer period may be allowed to pass without discounting the efficiency of the method but nothing is gained by delay. Indeed, the shorter the interval the more acceptable it will be to everyone concerned, and I suspect that two or three hours will ultimately be found sufficient, though here again I have not studied trifling variations from the original schedule.

Unless some complication of pregnancy demands haste, the character of the cervix should be favorable to rupture of the membranes before this method is employed. As I have never dilated the canal to facilitate induction, there has been no occasion to use an anesthetic. My practice is to request patients to return for a weekly examination and postpone induction until the internal os will admit two fingers. The length of the cervical canal is irrelevant to a successful result.

When rupturing the membranes, the possibility of prolapse of the cord should never be forgotten. This accident has not happened to me and may always be avoided, I believe, if the vaginal manipulations are gentle and do not displace the head. Firm pressure made on the fundus by an assistant has proved to be a valuable prophylactic measure. The need for precaution requires emphasis, I am sure, for once or twice I have found a hand prolapsed beside the head even before attempting rupture of the membranes, and have succeeded in pushing the part up before it became jammed tightly in an undesirable location.

Though some familiar implement like a tenaculum, toothed clamp or nasal applicator will rupture the membranes, I have found less awkward, two instruments designed for the purpose. The one devised by Doctor David S. Hillis⁵ of Chicago serves admirably when the membranes are closely applied to the head. Wilson's amniotic trocar,⁶ a sharper tool with protected point, is preferable, if the bag of waters pouches into the cervical canal, a phenomenon more common in primiparae. The escape of fluid corroborates the fact that the membranes have been ruptured and only a small quantity serves this purpose. A large quantity, while unobjectionable, has no special advantage.

After the membranes have been ruptured, certain routine observations of a reassuring nature should be made. It is desirable to check the fetal

heart sounds, to ascertain by abdominal palpation the relation of the head to the pelvic inlet, and to note the degree of uterine retraction following the escape of amniotic fluid. Careful study may reveal conditions unfavorable to the use of pituitary extract: but I have never encountered them. In general one prepares immediately a small pledget of cotton which will fit the nostril, fastens to it a piece of string to facilitate its ultimate removal and saturates the cotton with pituitary extract. One ampule is absorbed by a pledget of convenient size which may be introduced with an ordinary mosquito clamp, but the typical nasal forceps is preferable. Following the path of least resistance, the pledget is lodged between the septum and the inferior turbinate.

Of course the use of pituitary extract is not always required. Oil and quinine with, or without, rupture of the membranes will often suffice. J. Whitridge Williams⁷ comments upon this fact in the last edition of his textbook.

The elimination of the routine administration of pituitary extract in the practice of Williams, has been discussed at his request in an able essay by Guttmacher and Douglas⁸ after a comparative study of that method and the one I proposed. In other words, they record two series of cases; with one, pituitary extract was used, while with the other it was not. The latter group of patients experienced a longer delay between the time of rupturing the membranes and the onset of uterine contractions. Labor, too, advanced more sluggishly. The modification suggested, which I admit to be in the direction of simplicity and also a safeguard toward keeping a powerful oxytocic out of incompetent hands, would seem to mean the sacrifice of time and certainty, a sacrifice that would be justified were the intranasal use of pituitary solution harmful.

If the obstetrician be competent and conscientious, the method I have proposed will not offer difficulty nor prejudice the successful termination of labor. The technic is simple and the dosage of pituitary extract may be controlled by withdrawal of the cotton, thus minimizing the risk of tetanic contractions. This risk has passed in any case half-an-hour after the application was made. Continuous supervision for so brief a period provides effective insurance against accidents attributable to medication. And the treatment may be used as safely in all cases as in those which progress unsatisfactorily. When pituitary extract is employed, the time saving factor, not unacceptable to the patient, becomes apparent. The total length of labor in the case of multiparae in my series was from two to five hours and in primiparae from four to eight hours. Guttmacher and Douglas found that "the length of labor in multiparae was only one-half as long when pituitrin was given." The primiparae, they observed, experienced labors averaging approximately ten hours whether pituitrin was used or not; but the delay between the rupture of the membranes and the onset of pains, an interval they designate the latent period, was twice as long if pituitrin was omitted. Except in a few

instances in which nasal abnormalities were found to explain a meager absorption of pituitrin the "latent period" in my experience was too short for separate consideration, and arbitrarily, perhaps, I have estimated the duration of labor as the period elapsing from the time when the membranes are ruptured until the placenta is expelled.

Before attempting to anticipate and answer pertinent questions regarding the course of labor, the delivery, the placental stage, and the puerperal period, I should say something of the character of my material. Multiparae predominate because with them parturition is generally simpler. Consequently, at first I tried to keep on safe ground while feeling my way and excluded primiparae. Again, dilatation of the cervix begins prior to the onset of labor more frequently in multiparae. However, the same phenomenon occurs in the first pregnancy more often than I supposed until my interest in this problem led to systematic observations: 32 primiparae are included in the series.

In many instances the method was employed after the expected date had passed but more frequently preliminary to it by a period of from one to three weeks. The more premature cases were complicated with albuminuria but fortunately even there the degree of prematurity did not prove to be a serious handicap. Except in the case of the intra-partum death already mentioned, the infants not only were born alive, weighing from five to nine pounds, but progressed normally while under my observation. At the end of six weeks, they were all found well-nourished and healthy. There was nothing in their appearance at birth or subsequently to suggest that the method was at all harmful. Twins were encountered twice; in each instance version was performed on the second child without difficulty. Breech presentations were treated in the customary way. Posterior occipital presentations rotated anteriorly with wonted frequency; only two of 27 posteriors rotated into the hollow of the sacrum.

The course of labor may be shortened by the procedure though it is not recommended for that purpose. I am now describing a method for the induction of labor, not for its management. Nevertheless, we should know that the character of labor is not influenced adversely. And this fact may be accepted confidently on the basis of the material already studied.

The duration of labor, as I have said, has been reckoned from the time when the membranes are ruptured to the expulsion of the placenta. Usually uterine contractions begin shortly after the nasal application of pituitary extract but they may escape the notice of the patient until fifteen to thirty minutes have passed. The first symptom is described ordinarily as slight discomfort in the back resembling a "menstrual cramp." This returns at intervals of five to ten minutes, coincident with contractions. The pains increase gradually in frequency and strength while cervical dilatation advances rapidly in most cases. To gather pertinent data of scientific, rather than therapeutic, interest,

rectal examinations were made frequently. Generally the cervix became effaced at the end of an hour; one-half the required dilatation was accomplished within two hours and full dilatation after a period of two and one-half to four hours. The second stage also proceeded rapidly and terminated spontaneously in 89 of the multiparous women. There were three breech presentations. Low or midforceps were used seven times. Version in addition to its use with two cases of twins was performed once. Among the primiparae there were 15 spontaneous deliveries, 15 low to midforeeps, one breech, and one version and extraction. The indications for operative delivery differed not at all from those customary in routine practice.

With regard to its pharmacologic action when pituitary extract is administered intranasally, a few observations are noteworthy. Atypical experiences of two kinds were encountered, namely, a violent action on the one hand and a sluggish one on the other. In five instances within ten minutes following its administration the uterus contracted tetanically and the fetal heart sounds, though distinct, became slower. Without doubt this phenomenon was a sign of danger; and the plug of cotton was promptly withdrawn. Then the uterus relaxed slowly, rhythmic contractions became established and labor proceeded without further complication; in all these cases living children were born spontaneously.

More often the pituitary extract acted sluggishly, a phenomenon almost certainly explained by some interference with its absorption. Indeed anatomic peculiarities of the nose have been demonstrated. Obliging rhinologists* have been kind enough to make the necessary examinations. Some of the patients gave a history of operation upon the nose and the resulting scar tissue obviously would impair absorption. Again deflected septa or spurs productive of atrophic changes in the mucosa were found. It is my impression that the architecture of the nose affects the rate of absorption of the pituitary extract and influences its action, thus becoming a fundamental factor in the rapidity with which labor is brought on. Striking illustrations of the sluggish action were given by two patients who did not respond to the induction procedure on a given afternoon, yet did respond, though tardily, the following morning when it was repeated. In each instance an atrophic mucosa probably absorbed little, or none, of the pituitary extract at any time. Success on second trial should be ascribed, I believe, to the oil and quinine, the membranes having been ruptured for a longer period, more favorable to the prompt action of medication.

In the event of poor absorption the dosage of pituitary extract must be increased by the replacement of one plug of cotton with another at suitable intervals. It is not helpful to employ a larger quantity with any given application, for the mucus secreted about the plug of cotton probably limits absorption to a period of twenty or thirty minutes. In gen-

*For these examinations I desire to thank Doctors Harold D. Barnard, Frederick H. Linthicum and C. Harry Montgomery.

eral, one or at most two applications suffice but four to six have been required by a few individuals with nasal abnormalities. It is reasonable to use the nostrils alternately, making a new application when the uterine contractions weaken or appear at gradually lengthening intervals for the period of an hour.

This method of induction has no unfavorable effect upon the third stage of labor. As a rule the loss of blood is small. Measurements have not been made but the estimates recorded range between 150 and 350 c.c. with the majority of cases approaching the lower figure. The placenta separates in from five to fifteen minutes. One abnormality only appeared in the third stage, a postpartum hemorrhage attributed to a large fetus, probably postmature, requiring manual removal of the placenta. The puerperal morbidity was not increased and noteworthy complications occurred in no case during the convalescent period of six weeks.

My report would be incomplete without frankly answering another pertinent question: What has been taken as a fair indication for the use of the method? When the material was reviewed from this standpoint I was surprised at the number and the variety of reasons leading to its employment. Generally, the procedure has been justified on technical grounds; but, after my confidence in its safety was established, I have been influenced by sentimental considerations which often carry great weight with obstetric patients.

At first induction was employed chiefly on account of the nervousness, impatience, discouragement, whatever name one may give the mental attitude, of women who have passed their expected date. In this group there are 35 cases. Five other patients who had experienced "false labor," entered the hospital on account of symptoms which disappeared in the course of twenty-four hours. There were six toxemias with albuminuria and another with glycosuria. Two individuals were formerly tuberculous with the disease now arrested. One patient presented a valvular heart lesion approaching decompensation. Serious discomfort from varicose veins twice justified the procedure. Premature separation of the placenta with a moderate amount of bleeding was treated successfully in two cases, but in a third the bleeding was not controlled by rupture of the membranes and the administration of pituitrin. In the last instance cesarean section with hysterectomy was performed, inasmuch as the uterine musculature presented numerous small hemorrhagic lesions which at times accompany this complication.

Less technical, though not impractical, reasons for anticipating the spontaneous onset of labor related to patients who had previously experienced a precipitate birth and, therefore, were apprehensive of not reaching the hospital in time for medical supervision and care. Without such a history, others living at a distance willingly accepted my recommendation of induction. The acceptance of these casual indications attests my conviction that the method is safe and sound. Nevertheless, if

injudiciously used, there is no doubt in my mind that it will be found unsatisfactory. No one should employ it, unless he has been well grounded in the practice of obstetrics. The procedure is applicable only to selected cases and their selection requires the exercise of mature judgment. When I have recommended it, the patient has been under my supervision during pregnancy and, consequently, I was familiar with the problems her case presented.

Thus far my remarks have purposely been confined to the practical aspects of bringing on labor. However, since the method I propose runs counter to orthodox obstetric teaching, certain comments of a theoretical character which may not be omitted altogether are made briefly in conclusion. I refer to the mechanism of cervical dilatation which is ascribed, almost axiomatically, to the action of a hydrostatic wedge composed of the membranes and the amniotic fluid. This medium, it is assumed, transmits the force of the uterine contractions and pushes aside the cervical barrier of the birth canal. In my judgment, that hypothesis is disproved, as far as negative evidence can do so, by the course of labor following induction by rupture of the membranes. Deprived of the possible action of such a mechanism, 132 cases reported here have suffered no handicap with regard to the first stage and terminated successfully. Nor did the presenting part of the fetus act as a substitute for the hydrostatic wedge. This contingency was kept in mind and excluded by careful, frequent rectal examinations during labor and by the later inspection of the infant's head which presented merely the usual molding and but very rarely a caput succedaneum. The development of cephalematoma did not occur in a single instance.

The phenomena associated with the transformation of the cervix were those we accept as normal. First, the canal became effaced with the simultaneous obliteration of the internal os; and subsequently the external os became more and more widely dilated. From beginning to end the mechanism of the first stage may adequately be explained by retraction of the uterus, the rearrangement of the muscle fibers in response to the forces which pull them upward toward the fundus. Whether some other mechanism is invoked when the amniotic sac remains intact, I cannot affirm. But, it is unreasonable to think so. The responsible mechanism in cases where rupture of the membranes has been employed as an initial procedure is also, I believe, the normal mechanism. To my mind the classical explanation of the means by which cervical dilatation is routinely accomplished must be revised.

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AN ANALYSIS OF 158 CASES OF PLACENTA PREVIA*

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AMONG 32,500 labors occurring at the Jewish Maternity Hospital during the twenty-two years, 1909-1930 inclusive, there were 158 cases of placenta previa, an incidence of practically 0.0048 per cent, or one case in 205 deliveries. Of these, 20 cases, or 12.6 per cent, were placenta previa centralis, 37 cases, or 23.4 per cent, were placenta previa partialis, and 101 cases, or 63.9 per cent, were placenta previa marginalis.

Forty-two cases, or 26.5 per cent, were primiparae. One hundred and sixteen cases, or 73.4 per cent, were multiparae. Only one patient gave a history of having had placenta previa in a former pregnancy. One patient, who had a marginal placenta previa, developed antepartum eclampsia. Of the multiparae studied 38 were para ii, 20 para iii, 24 para iv, 13 para v, 5 para vi, 5 para vii, 6 para viii, 2 para ix, 2 para x, and 1 para xi.

The Age Incidence of Patients Was as Follows.—Between the ages of nineteen and twenty years inclusive, there were 8 primiparae; between twenty-one and twenty-five, 23 primiparae and 23 multiparae; between twenty-six and thirty, 8 primiparae and 33 multiparae; between thirty-one and thirty-five, 3 primiparae and 25 multiparae; between thirty-six and thirty-nine, 26 multiparae, and between forty and forty-five, 9 multiparae. The youngest patient was a primipara of nineteen, and the oldest a para xi, aged forty-five years. It is interesting to note that as the parity and obstetric age of the individual increased, the tendency of placenta previa to increase became more apparent.

Onset of Bleeding.—Of the 158 cases studied in which it was stated at what period of gestation the onset of bleeding occurred, in 2 it was first seen at five months, 2 at five and one-half months, 3 at six months, 7 at six and one-half months, 15 at seven months, 5 at seven and one-half months, 31 at eight months, 26 at eight and one-half months, and 67 at nine months of pregnancy. Therefore in 14 cases, or 8.8 per cent, bleeding occurred from the fifth up to the seventh month. In 20 cases, or 12.6 per cent, bleeding occurred during the seventh month. In 57 cases, or 36 per cent, bleeding occurred between eight and eight and one-half months, and in 67 cases, or 42.4 per cent, bleeding took place at term. Profuse hemorrhage accompanied by the usual systemic signs and symptoms of blood loss occurred in 41 cases, or 26 per cent, of which 15 occurred in central, 15 in partial, and 11 in the marginal type of placenta previa.

Presentation.—The proportion of malpresentations among the 158 cases on admission was 17 breech and 13 transverse presentations, a total

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of 30 cases, or 19 per cent, or about one out of every five cases. Twenty-three of the 30 cases were premature deliveries.

Prolapse of Cord.—There is an especial tendency to the production of prolapse of the cord in placenta previa generally produced by the interposed placenta, which hinders the natural presentation and engagement of the head. In our series we had 2 cases.

Laceration of Cervix.—Cervical tears with bleeding that were severe enough to necessitate repair occurred in 12 cases; 10 were unilateral and 2 bilateral. Four followed manual dilation of the cervix and version, and 8 followed version.

The Stage of Gestation When Delivery Occurred Was as Follows.—From the fifth to the seventh month there were a total of 8 cases. From the seventh to the eighth month there were 21 cases, from eight to eight and a half months 56 cases, and at nine months 73 cases. From this it can be seen that in our series, premature labor occurred in 85 cases, or 53.7 per cent, a little more than one-half the cases. Labor followed hemorrhage in 70 out of 158 cases, or 44.3 per cent.

Mode of Delivery.—The various methods of delivery gave the following results:

1. Seven patients delivered spontaneously with one maternal death, or 14 per cent, and no fetal deaths.

2. Artificial rupture of the membranes with spontaneous delivery was carried out in 28 cases of marginal placenta previa with slight bleeding, in 6 of which pituitrin had been used, with no maternal and no fetal deaths.

3. Braxton-Hicks bipolar version was performed in 4 cases, with one maternal death, or 25 per cent, and one fetal death.

4. A modified de Ribes' bag was introduced extraovularly in 74 cases and intraovularly in 3 cases. In 40 cases, or 39 per cent, the bag was used in marginal, in 32 cases, or 86 per cent, in partial, and in 5 cases, or 25 per cent, in central placenta previa. In 3 of these cases a large bag was introduced immediately after the expulsion of a small bag. Following the expulsion of the bag, 24 of the patients in the marginal and partial group delivered spontaneously after artificial rupture of the membranes. Ten of these patients had been given pituitrin. There was one maternal death, and five fetal deaths, one of which was non-viable. One patient in whom a bag was introduced died undelivered. Eight delivered by breech with no maternal and 2 fetal deaths. In the remaining 44 cases the bag was employed as a preliminary step in the treatment, and following its expulsion or removal 9 of these patients were delivered by forceps with no maternal and 2 fetal deaths, and 35 by internal podalic version (*two of which required subsequent craniotomy on the after-coming head and two a forceps on the after-coming head*) with 2 maternal and 11 fetal deaths. In 6 of the cases the cervix and vagina were packed with gauze. This stimulated the uterus to

contract, to soften the cervix, and to dilate it sufficiently to permit the introduction of a bag. Altogether in this series of 77 cases, there was a total of 4 maternal deaths, or 5.2 per cent, and 20 fetal deaths (one of which was nonviable), or 28 per cent.

5. Internal version was performed on 19 patients. The membranes were ruptured artificially in all. There were 3 maternal deaths, or 16.6 per cent, and 5 fetal deaths (one of which was nonviable), an incidence of 29 per cent. On 7 of these an accouchement forcé followed by version and extraction was performed; 6 of these occurred in the period 1909-1912; the seventh in 1922. Two were in central, 2 in partial, and 3 in marginal placenta previa. This resulted in 2 deaths, one occurring in 1909, and the other in 1922.

6. Forceps were employed in 5 cases with no maternal and one fetal death.

7. There were 7 cases of breech presentation. In this series there were no maternal deaths and two fetal deaths, or 40 per cent.

8. Classic cesarean section was performed on 10 patients, 9 in central placenta previa and 1 in marginal placenta previa. Of these, 3 were primiparae and 7 multiparae. Six were at term, 3 in the last two weeks of pregnancy, and one at six and a half months. There were 3 deaths in this series, all multiparae, giving a maternal mortality of 30 per cent, and 2 infant deaths after delivery, or 20 per cent, and one stillborn on a nonviable baby. Maternal deaths occurred in the following operative cases:

CASE 1.—Admitted in 1928. Age thirty-three. Para iv. At term. History of 2 previous stillbirths. Marginal placenta previa. Transverse presentation. History of bleeding at home for two days. Observed in hospital for twenty-four hours. Not in labor. Sudden profuse hemorrhage. Classic cesarean section. Spinal anesthesia. Died of hemorrhage and shock two hours postpartum, while being prepared for blood transfusion. Baby died two hours postpartum. That death was caused by shock and hemorrhage in this case might possibly be explained by failure to pack the uterus, and by the use of spinal anesthesia which might have been a contributory factor due to splanchnic dilatation following the lowering of the intraabdominal pressure.

CASE 2.—Admitted 1912 as emergency case. Para iv. Age thirty-seven. At term. Central placenta previa. Bleeding profusely on admission. In shock. Not in labor. Cervical dilation one finger. Classic cesarean section one-half hour later. Died from peritonitis on fourth day postpartum.

CASE 3.—Admitted 1925. Para iv. Age forty. Eight and a half months pregnant. Central placenta previa. History of bleeding at home for twelve days. Not in labor. Cervical dilation one finger. In shock. Classic cesarean section two hours after admission. Baby died twenty-four hours postpartum. Mother died from peritonitis on the ninth day postpartum.

In both instances the cause of death was ascribed to peritonitis. In each case the patient had been admitted in a condition of shock. No blood transfusion was given prior or subsequent to operation. The resistance of the patient might have been raised if a transfusion had been given and thereby possibly improved her chances of recovery.

9. In analyzing the treatment of central placenta previa in our series of 20 cases I found that 11 were treated by the vaginal route. (All these cases treated per vaginam occurred in multiparae.) Of the vaginal cases 2 patients were treated by Braxton-Hicks bipolar version with no maternal and one fetal death; 1 patient, treated by bag, died undelivered; 4 patients were treated by extraovular insertion of bag and version, with no maternal and 4 fetal deaths; and 4 patients were treated by internal version (in one of whom the cervix was manually dilated) with 3 maternal and 3 fetal deaths. The cause of death in the 3 maternal cases thus treated was puerperal infection. Only one of these patients received blood transfusion. Two of these cases were complicated by phlebitis. One patient died on the fifth day, one on the thirty-fifth day, and one on the forty-fifth day postpartum. The patient who died undelivered was admitted in 1923. She was a para ii, aged twenty-seven. History of bleeding at home for three weeks. Admitted as emergency case. Central placenta previa. At term. In labor. Cervical dilation two fingers. Stillborn. Moderate shock. Introduction of number 5 bag one hour after admission. Died intrapartum four hours and fifteen minutes after admission from hemorrhage and shock. No blood transfusion given. Temporizing too long at home, and then the desire to empty the uterus rapidly without preliminary treatment of hemorrhage and shock may be held to be the causes of death in this case. The total maternal mortality in this group treated by conservative delivery from below was 4 cases, or 36.3 per cent, and the fetal mortality (the duration of pregnancy having been thirty-six to thirty-eight weeks) was 8 cases, or 80 per cent. Of the 8 fetal deaths, one was stillborn on admission, 4 were stillborn following treatment, and 3 died four hours after delivery. The maternal mortality of the 9 patients (3 of whom were primiparae and 6 multiparae) delivered by abdominal cesarean section was 2, or 22 per cent. Both deaths occurred in multiparae. The fetal mortality was 22 per cent. If we deduct the one stillbirth which occurred in a nonviable child, we have a corrected mortality of 11 per cent.

Management of Placenta.—In 106 cases the placenta was delivered spontaneously. In 7 cases the Credé method was used. In 35 cases, or 23 per cent the placenta was removed manually. This does not include cesarean cases.

Maternal Morbidity.—The total maternal obstetric morbidity was 21 per cent. Puerperal fever developed in 8 patients following cesarean section, in 11 patients after version, in 2 after forceps deliveries, in 8 after bag-version, in 4 after bag-spontaneous, and in 1 after bag-forceps. The temperature ranged between 101° and 103° F. for an average of eight days. Three cases were complicated by a unilateral phlebitis; one patient having fever for forty-five days, and another with a bilateral phlebitis had fever for thirty-eight days. One patient developed a bilateral pyelitis.

Maternal Mortality.—The total maternal mortality among the 158 cases was 12, or 7.5 per cent. From 1909 to 1915 inclusive there were 6 deaths, from 1916 to 1920 one death, from 1921 to 1925 four deaths, and from 1926 to 1930 one death. Four cases occurred in marginal placenta previa with a mortality of 3.8 per cent, 2 in partial placenta previa with a mortality of 5.4 per cent, giving a combined mortality of 6 cases, or 4.3 per cent, in the incomplete variety. Contrasted with these figures the maternal mortality of complete or central placenta previa was 6, or 30 per cent.

In the fatal cases death occurred after the following maneuvers: 1 after spontaneous delivery, 1 after Braxton-Hicks bipolar version, 1 after bag induction, the patient dying undelivered from hemorrhage and shock; 1 after bag-spontaneous, 2 after bag and version (in 1 the cervix was manually dilated), 3 after internal version (in 1 the cervix was manually dilated), and 3 after classical cesarean section.

The causes of death were: peritonitis, 2; hemorrhage and shock, 5 (3 died from postpartum hemorrhage); and puerperal infection, 5.

An analysis of the 5 deaths not previously discussed shows that 2 occurred in partial and 3 in marginal placenta previa. One patient of the partial type, a primipara, seven and a half months gravid, who had been bleeding for two weeks before admission, was treated by vaginal packing, bag and version, followed by manual removal of the placenta. She died on the fourth day postpartum from puerperal infection. No blood transfusion was given. In the other case, a primipara, eight and a half months gravid, who had been bleeding for two weeks before admission, a bag was introduced, followed by manual dilation of the cervix, and craniotomy on the after-coming head. The placenta was removed manually. The cervix was found lacerated. She died on the sixteenth day postpartum from puerperal infection. The 3 patients with marginal type placenta previa died of postpartum hemorrhage and shock. None of them received blood transfusion. One was treated by Braxton-Hicks bipolar version and died within three hours of delivery. The uterus had been insufficiently packed. Another was treated by bag and delivered spontaneously. The placenta was removed manually. The uterus was not packed. Patient died two hours after delivery. The third patient delivered spontaneously. An adherent placenta was removed manually four hours after delivery. The uterus was packed. The patient died from hemorrhage and shock seven hours postpartum. The cervix was inspected in each of the three cases just cited and was found intact.

From a study of the 12 maternal deaths, one can see that accoucheement forcé and failure to pack the uterus after delivery accounted for some of the death. Nine of the 12 patients did not receive blood transfusion in our series from 1909 to 1925. A timely blood transfusion would undoubtedly have saved many of the patients. Since 1926, out of 25 cases only one was lost. This low mortality is, I believe, due in a great measure to early blood transfusion.

Fetal Mortality.—An analysis of the fetal deaths showed that 46 infants, or 29.2 per cent, were stillborn. Of these, 16 infants, or 10 per cent, were stillborn on admission. Four were nonviable, 9 were premature, and 3 were full term. There were 30 infants, or 19 per

cent, stillborn following treatment. Three were nonviable, 16 were premature, and 11 were full term.

Twenty babies died from half an hour to ten days after delivery. One was nonviable, 15 were premature, and 4 were full term. The greater number of premature babies died within twenty-four hours after delivery. Of the full-term babies, 1 died from purpura on the eighth day; 1 died from pneumonia on the tenth day, and 1 died from inanition on the sixth day.

The infant mortality for viable infants was 36.7 per cent. The total fetal mortality was 66 cases, or 41.7 per cent. If we deduct the 16 still-born cases where the fetal heart was absent on admission, we have a fetal mortality of 31.6 per cent.

Treatment.—In discussing the treatment of placenta previa there are definite cardinal principles involved which one must observe and adhere to if we are to get satisfactory results. The first question of importance in any method of treatment is the maternal mortality. One should also take into consideration the parity of the patient, the number of living children, the viability of the child, the type of placenta previa he is dealing with, the degree of bleeding, the amount of dilation of the cervix, and whether the patient is in labor.

In the majority of hemorrhages studied, our records revealed that there had been a warning hemorrhage for days or weeks previously. In other instances the bleeding was slow but long continued. The natural inclination is to temporize. Hemorrhage and sepsis are the commonest causes of death. If the patient escapes these, she is left so exhausted that she is less able to resist morbid influences, which render her especially liable to many complications and a prolonged convalescence. And, since the treatment of placenta previa is primarily one of hemorrhage, and there is no treatment except delivery which will stop the hemorrhage, then it must at once become apparent that temporizing exposes the patient to too many risks. The fetal mortality is enormous. This fact must also be carefully borne in mind with a view to treatment, especially as the great majority are premature and do not survive.

Therefore, as soon as placenta previa is suspected, be the bleeding great or little, avoid doing a vaginal examination at home unless one is prepared to pack the vagina with iodoform gauze. The patient should then be immediately transferred to a hospital, for the hemorrhage may at any time recur and become serious. Here, she may be observed for a short period only if the bleeding is slight and the child is near viability; otherwise the case should be terminated at once no matter what the period of pregnancy.

On admission to the hospital, note the temperature, pulse, respiration, and blood pressure. The pulse is taken every fifteen minutes thereafter, and the systolic pressure recorded at least once every half hour. A blood count should be made, the hemoglobin estimated, and a speci-

men of blood taken to be typed and matched for possible blood transfusion.

When vaginal examination for diagnostic purposes is done, it should be conducted under strict aseptic precautions, and only after one is prepared to treat the case immediately. The danger lies first, in the fact that it will disturb blood clots which have already checked the hemorrhage and thereby cause fresh bleeding, and second, in the possibility of introducing bacteria into the placental sinuses.

If on admission the patient shows evidence of shock and collapse, this condition should be treated first, and labor if it has not already begun is induced later. Administer $\frac{1}{4}$ to $\frac{1}{2}$ grain of morphine by hypodermic. Pack the vagina tightly with 5 per cent iodoform gauze. Place the patient in the Trendelenberg position. Inject 1000 c.c. of normal saline solution by hypodermoclysis beneath the breasts. If a donor is not available give an intravenous infusion of saline or glucose solution. Arrange for transfusion as soon as donor can be secured.

Shock following blood loss will frequently lead to complications and death. It must be combated vigorously. Whenever possible, defer operative procedure while the initial shock exists, and until the systolic blood pressure has risen to 90 mm. of mercury or above.

Blood transfusion when given early offers one of the most effective agents to combat loss of blood, lessens the tendency to further hemorrhage, increases the contractile power of the uterus, raises the blood pressure, and slows the pulse. Even the acute anemia, high morbidity, and delayed convalescence incident to hemorrhage can and should be prevented to a great degree by the proper use of this measure. Taking cognizance of this important point we have made every effort during the past five years to use blood transfusion routinely on all our cases.

In patients with marginal and partial types of placenta previa with slight bleeding and the cervix well dilated, and the presenting part engaged, the membranes should be ruptured, a very tight abdominal binder applied, and the patient should be given a small dose of pituitrin, 2 to 3 minims, which will expedite the labor and effect a spontaneous delivery. When bleeding is excessive at the time of rupture of the membranes and the cervix is sufficiently dilated, a version should be done.

In the following type of case I believe the best results have been obtained by employing the conservative method. In patients with the marginal and partial types of placenta previa when the bleeding is slight or moderate and the cervix admits two fingers, labor is induced by the extraovular insertion of a modified de Ribes' bag No. 4 or 5, almost as a routine. This excites pains, dilates the cervix, and controls the hemorrhage. The patient is kept in the operating room, as the bag is usually expelled into the vagina within a short time. In the cases where a small sized bag has been used, one should be pre-

pared to introduce a larger one if necessary. Since hemorrhage may or may not occur, it is advisable that the operator remain with the patient until she is delivered and absolutely out of danger. After the largest bag has passed the cervix, then rupture the membranes. If there is no bleeding and the vertex comes down to exert pressure upon the lower uterine segment and the edge of the placenta, allow the patient to deliver herself spontaneously, aided possibly by a small dose of pituitrin, or expedite the delivery with forceps if necessary. On the other hand, if, following the rupture of the membranes, bleeding is profuse and the vertex does not come down and the cervix is dilated enough to admit the hand, then perform a podalic version. Since manual dilation of the cervix invariably results in manual laceration, this procedure should be condemned. After a leg has been brought down, the labor is allowed to terminate naturally, extracting the child gradually. Although we have had no personal experience with rupture of the lower uterine segment as a complication, nevertheless it should be guarded against.

Every effort is made during the entire delivery to prevent bleeding and shock. As previously stated, it is considered good judgment to transfuse all patients when indicated before or coincident with active delivery, and retransfuse after delivery when necessary.

If there is no bleeding following the birth of the fetus, wait for the placenta to separate naturally; but if the bleeding still continues, use Credé's method, and if it is not effective, remove the placenta manually.

In every case of placenta previa as a precautionary measure the uterus should be packed tightly with 5 per cent iodoform gauze through a tubular packer and the pack allowed to remain for three or four days.

If when the cervix is inspected, it is found lacerated and if the bleeding continues, it should be repaired.

The vagina is packed with iodoform gauze. Pituitrin and gynergen are given by hypodermic injection to maintain contraction of the uterus. The fundus should be watched carefully for a period of several hours after the third stage to maintain contraction of the uterus. Not infrequently, relaxation of the uterus or bleeding from the placental site in the lower noncontractile uterine segment will occur, resulting in a serious and possibly fatal hemorrhage.

In complete or central placenta previa when the cervix will admit two fingers, extraovular insertion of the largest size bag is advantageous in the average case. Following the expulsion or removal of the bag the hand is introduced into the uterus and a leg brought down. However, in central placenta previa one should individualize his case. Regardless of the parity or period of gestation, abdominal cesarean section must always have its place.

In the serious emergency cases in which patients are admitted practically exsanguinated from loss of blood, and subjected to conservative or radical operative measures which will only help further to increase the existing prostration and shock, it is a question whether it may be possible for a patient to survive, unless we first combat the shock with morphine and blood transfusion. Following the reaction, the patient should be delivered and retransfused if necessary.

Central placenta previa has the greatest maternal and fetal mortality. Every effort should be made to reduce both. From a comparative study of our own results obtained in 20 cases treated by conservative and radical measures, we must conclude that active treatment gives much better results for both mother and child. For this reason, under certain conditions, I would favor abdominal cesarean section as the operation of choice in all primiparae having a closed or slightly dilated cervix, at or near full term, with a living baby, and the mother in good condition. In multiparae, provided the patient complies with the above indications, one may expose the mother to an additional risk of operation, if she desires a living baby.

In reviewing statistics I find that there is as yet no unanimity of opinion with regard to this operation, although in recent years more clinics have been resorting to section in central placenta previa than heretofore, and the results seem fully to justify this procedure.

CONCLUSIONS

1. Both maternal and fetal mortality can be considerably reduced if proper supervision of all bleeding cases be given early, while the patient is in good condition, rather than attempt to temporize too long.

2. All vaginal examinations should be avoided, unless one is prepared to treat the case immediately, for it may result in severe hemorrhage difficult to control.

3. Every effort should be made to conserve blood and combat shock. If shock and hemorrhage are present, they should be treated first and labor induced if pains have not begun.

4. Manual dilation of the cervix followed by version and extraction gives a very high maternal and fetal mortality, and this form of treatment should be condemned.

5. The routine insertion of a bag extraovularly in marginal and partial cases of placenta previa has given satisfactory maternal results and has lowered our fetal mortality considerably.

6. On account of the very high fetal mortality due to prematurity and prolonged bleeding, the mother should receive first consideration; unless the treatment to be instituted to save the child is not antagonistic and will not imperil the life of the mother.

7. In all types of placenta previa following the expulsion or removal of the placenta the uterus should be firmly packed with iodo-

form gauze so as to favor contraction and retraction of the uterus. Frequently upon failure to observe this rule relaxation of the uterus will occur which will result in a serious and sometimes fatal hemorrhage from one to several hours postpartum.

8. Blood transfusion is indicated on all patients who have a low red blood count, low hemoglobin, and a systolic blood pressure below 90, following hemorrhage and shock. During the past five years since this procedure is being more definitely used as a prophylactic measure in antepartum, intrapartum, and postpartum cases, not only have our maternal and fetal results improved, but the morbidity has been lessened, and convalescence hastened.

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1 WEST ONE HUNDRED AND TWENTY-THIRD STREET

THE CESAREAN SECTION STATISTICS FOR THE CITY OF PORTLAND, OREGON, FROM 1926 TO 1929

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IN RECENT years several articles have appeared dealing with the operation of cesarean section in different parts of the country. To date, no such series has been reported from the Northwest. Feeling that such a study might be interesting an attempt was made to review all cases of cesarean sections done in Multnomah county from Jan. 1, 1926, to Dec. 31, 1929. Every hospital and nursing home where there was any possibility that a cesarean section might have been done was canvassed. Because of the excellent cooperation in all instances, it is believed that practically every cesarean section performed during these years was located. There were in all 217 cesarean operations, of which the charts were personally reviewed in all but nine cases. There were during the same period 19,313 births reported in Multnomah county, an incidence of one section to every 89 births, or 1.12 per cent. In the hospitals where the charts were available for study, there were 208 sections in 10,737 births or an incidence of 1.9 per cent. In reviewing these statistics, it must be remembered that they comprise the results of specialists, surgeons, and general practitioners. One hundred and one cesarean sections were performed by specialists, and 107 by physicians not limiting their work to this field. While there is not space here to enumerate the percentage of indications for each group, it is interesting to note that there is a marked similarity in all but two types of cases. Twelve of the 14 cesarean sections done for eclampsia

were performed by the nonspecialist group. On the other hand, the obstetrician performed 7 cesarean sections for cervical stenosis while his nonspecializing colleague did no cesarean sections because of this condition. In Table I are listed the various indications for which the operation was performed, together with the percentage of each indication. Special comment will be made only on the more important and interesting indications.

TABLE I. SHOWING THE INDICATIONS FOR CESAREAN SECTION IN THE GROUP STUDIED TOGETHER WITH THE PERCENTAGE OF EACH INDICATION

Dystocia (54.9%)	Disproportion (40%)	Contracted Pelvis (36.7%)	{	Gen. cont. (14%)
				Flat (9.1%)
	Excessively large child (3.3%)		{	Funnel (5.8%)
				Deformed (3%)
				Not stated (5%)
	Abnormal presentations (3.9%)			
	Obstructing tumors (5.6%)		{	Fibroids (4.3%)
				Ovarian cysts (1.3%)
	Cervical rigidity (3.9%)			
	Uterine mal-action		{	Tetany (0.5%)
				Primary inertia (0.5%)
	Operative displacements of uterus (0.5%)			
	Previous cesarean section (7.7%)			
	Placenta previa (8.7%)			
	Premature separation of the placenta (3.9%)			
	Late toxemias of pregnancy (14%)		{	Preeclamptic toxemia (7.2%)
				Eclampsia (6.8%)
	To prevent damage to previous repair (1.5%)			
	Pulmonary tuberculosis (0.5%)			
	Heart disease (1.5%)			
	Desirous of living child (1%)			
	No indication stated (1%)			

Of the 76 operations done for contracted pelvis, 14 of the patients had had previous cesarean section, 38 were primiparae, and 16 others had had previous stillbirths on attempted vaginal delivery. Twenty-nine of these patients were submitted to a test of labor averaging eighteen and one-half hours.

In 7 instances, the cesarean section was done because of disproportion arising from an excessively large child. The smallest of these weighed 8 pounds 8 ounces, and the largest 11 pounds 8 ounces. The average weight of these babies was 9 pounds 2 ounces. In all 7 instances a test

of labor averaging twenty-three hours was given. Again all 8 cases of cervical stenosis had test labors averaging twenty-seven hours. Seven of these were primiparae while one was a multipara who previously had extensive cervical repairs with scar tissue formation. The youngest of the primipara was twenty-three years of age, the oldest thirty-nine years of age, while the average age of these 7 patients was thirty-one and a half years.

In studying the sections done for hemorrhage, it is interesting to note that the morbidity is increased in this type of case especially where vaginal examination has preceded operation. In the cases of abruptio placentae, the number of postoperative temperature days averaged one day more and in placenta previa two and three-tenths days more in those cases where a vaginal examination had been made.

Finally, it is interesting to study in more detail those operations done for late toxemias of pregnancy. There were 15 cases of preeclamptic toxemia of which 8 received preoperative hospital treatment for an average of seven and a half days. Again 5 of the 14 eclamptic cases received preoperative treatment averaging five hours. Of the 14 eclamptic cases 9 were primiparae, 4 were multiparae and in one case the parity was not stated. Table II gives the complete indications for which these sections were done.

The types of cesarean section employed in this series are shown in Table III. In view of the present predominance of authority favoring

TABLE II. SHOWING THE COMPLETE INDICATION FOR CESAREAN SECTION IN THE PREECLAMPTIC AND ECLAMPTIC GROUP

INDICATION FOR CESAREAN SECTION	PREECLAMPSIA	ECLAMPSIA
Toxemia alone	10	10
Toxemia plus two stillbirths	1	0
Toxemia plus large child	1	
Toxemia plus previous cesarean section	1	1
Toxemia plus elderly primipara	1	1
Toxemia plus contracted pelvis	1	1
Toxemia plus twin pregnancy	0	1

TABLE III. SHOWING THE NUMBER AND PERCENTAGE OF THE DIFFERENT TYPES OF CESAREAN OPERATION IN THE SERIES STUDIED

TYPE OF OPERATION	NUMBER	PER CENT
Classical	148	74.3
Classical plus hysterectomy	5	2.5
Classical plus sterilization	18	9.0
Classical plus myomectomy	5	2.5
Classical plus oophorectomy	2	1.0
Low cervical	8	4.0
Low cervical plus oophorectomy	1	0.5
Postmortem cesarean section	1	0.5
Not stated	10	5.0

the low section, it is interesting to note the comparatively low frequency of this operation in the present series. Inasmuch as all fatalities were following the classical type, it is hoped that a more frequent use of the low operation may reduce the mortality and morbidity.

A study of the morbidity shows that of the complications not resulting in death were 3 wound infections, 3 instances of pyelitis, 3 cases of anemia necessitating transfusion, 2 pulmonary complications, and one case each of liver abscess, phlebitis, pelvic abscess, endometritis, and breast abscess. Aside from these, there were 66 cases showing unexplained temperature for longer than seventy-two hours postoperatively. A more detailed study shows, as others have so often pointed out, that the morbidity is increased by both labor and vaginal examination. The average length of postoperative temperature for those cases done before the onset of labor was three days, for those where labor was less than ten hours, four and seven-tenths days and for those in labor longer than ten hours eight and one-half days. Again the average postoperative temperature days for those cases not having vaginal examinations was four and one-third days as contrasted with seven and one-third days in those cases where there had been a vaginal examination.

Tables IV and V show the cause of fetal and maternal deaths, respectively, together with the indication for which the cesarean section was done, and Table VI gives the mortality percentage of the various indications. In studying Tables V and VI, it will be seen that there were 3 maternal deaths among the 29 cesarean sections done for toxemia. However, it must be stated that one of these was a postmortem cesarean section in which the child was saved. In the other 2 the patients were morbid at the time of the operation and the section was done entirely in the interest of the child. While these latter two must be counted as cesarean section deaths, it is perhaps fair to discount them in figuring the corrected maternal mortality so far as cesarean section in toxemic patients is concerned.

TABLE IV. SHOWING THE DIFFERENT TYPES OF FETAL DEATH TOGETHER WITH THE INDICATIONS FOR CESAREAN SECTION IN EACH CASE

TYPE OF DEATH	INDICATION FOR CESAREAN SECTION	
Stillbirths (11)	Premature separation of placenta	7
	Prolapsed cord	1
	Tetany of the uterus	1
	Eclampsia	1
	Contracted pelvis	1
Died shortly after birth (5)	Disproportion (hydrocephalus)	1
	Eclampsia	1
	Previous cesarean section (Hemorrhage of newborn)	1
	Placenta previa	2
Premature (6)	Contracted pelvis	3
	Eclampsia	2
	Placenta previa	1

TABLE V. SHOWING THE CAUSE OF THE MATERNAL MORTALITY TOGETHER WITH THE ORIGINAL INDICATION FOR THE CESAREAN SECTION IN EACH CASE

CAUSE OF DEATH	NO. CASES	INDICATION FOR CESAREAN SECTION	
Peritonitis	2	Previous cesarean section	1
		Large child	1
Puerperal septicemia and liver abscess	1	Placenta previa	1
*Eclampsia	3	Eclampsia	3
Hemorrhage and shock	2	Contracted pelvis	1
		Premature separation of the placenta	1
Localized peritonitis and pneumonia	1	Contracted pelvis	1
Pulmonary embolus	1	Fibroid uterus with breech presentation	1

*See text for fuller description.

TABLE VI. SHOWING THE NUMBER AND PERCENTAGE OF MATERNAL AND FETAL DEATHS WHICH OCCURRED IN EACH INDICATION FOR CESAREAN SECTION IN THE SERIES STUDIED

INDICATION FOR CESAREAN SECTION	TOTAL NUMBER OPERATED	MATERNAL DEATHS		FETAL DEATHS	
		NUMBER	PER CENT	NUMBER	PER CENT
Preeclampsia and eclampsia	29	3	10.3	4	13.2
Contracted pelvis	76	2	2.6	4	5.2
Previous cesarean section	16	1	6.3	1	6.3
Placenta previa	18	1	5.5	3	16.6
Fibroid uterus	9	1	11.1	0	0
Large child	7	1	14.3	1	14.3
Malpositions and presentations	6	0	0	1	16.6
Premature separation of the placenta	8	1	12.5	7	87.5
Mal-action of the uterus	2	0	0	1	50.0
Total	217	10	4.6	22	10.1

Among the 217 cesarean sections, there were 10 maternal deaths (4.6 per cent) and 22 fetal deaths (10.1 per cent) or a total mortality of $7\frac{1}{3}$ per cent. On the other hand, if these figures be corrected by subtracting the 3 maternal deaths due to eclampsia where, as has been stated, the cesarean section was done only after the mother was dead or dying, and eliminating the 6 fetal deaths due to prematurity, the maternal mortality is 3.2 per cent, and the fetal mortality 7.3 per cent, giving a combined mortality of 5.3 per cent.

A STUDY OF THE MENSTRUAL HISTORIES OF 2,282 UNIVERSITY WOMEN

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EVERY physician caring for large groups of young women finds dysmenorrhea an important and often baffling symptom. Painful menstruation is obviously only a symptom, the causes of which are varied and complex.

In reviewing the literature on the causes and treatment of menstrual pain, one is impressed with its mass and the widely divergent opinions as to etiology and treatment. One point, however, upon which there is general agreement is that there is still much to be learned about this important problem.

A study of the findings in the menstrual histories and physical examinations of 2,282 University women is presented herewith. A complete physical examination, except for a pelvic examination, was given each student. The following menstrual history was recorded by the student at the time of the examination.

Menstrual history: Age menstruation was begun -----
Amount—small ----- medium ----- profuse -----
 Regular every ----- days
Periods Duration ----- days
 Irregular every ----- days
Discomfort—Yes, no. Pain (days, character)
Miss classes—Yes, no. Go to bed—Yes, no.
Previous treatment for menstrual disorders

The physician discussed with the student any abnormal menstrual symptoms which she had checked in the history and classified her as to menstrual function, each student being placed into one of the following four groups: normal menstruation, dysmenorrhea, irregular menstruation and amenorrhea. Only those students were put in the dysmenorrhea group who gave histories of having more than a mild discomfort at the menses.

INCIDENCE OF DYSMENORRHEA

Analyses which have been made of the incidence of dysmenorrhea show a great diversity of opinion. Reports of patients seen in private practice give a much higher incidence than reports based upon college women. This is probably a natural difference as women consulting a gynecologist do so because of some complaint, while a group of college women are a more or less unselected group of supposedly healthy individuals.

Jacobi,¹ one of the pioneers in the study of dysmenorrhea, in 1877 reported on the incidence of painful menstruation in 128 cases of schoolgirls and older women to whom questionnaires were sent and found it to be 47 per cent.

Sanes,² in 1916, reported on 4,500 menstrual histories of office patients. Of this group he found 47.4 per cent who complained of dysmenorrhea.

In 1920, Meredith³ published a report on functional menstrual disturbances of 749 college girls. She found an incidence of dysmenorrhea of 17 per cent.

Sturgis⁴ found that 34.9 per cent of 2,077 women employed in a department store had menstrual pain.

In 400 private patients, Bell⁵ found 46 per cent with dysmenorrhea and in 600 hospital patients 43 per cent.

Clow⁶ studied the menstrual histories of 2,050 girls, 1,346 in a secondary school and 220 in a teachers' training school. Of the entire group, 22 per cent had dysmenorrhea. In 17 per cent the dysmenorrhea was classified as slight.

Van Dwyne⁷ reported on the records of 3,072 women entering Goucher College from 1900 to 1924. She reports the incidence of dysmenorrhea as follows:

1900-1907	37.4 per cent
1917-1923	26.0 per cent
1923-1924	13.4 per cent

Miller⁸ in 1930 reported on the incidence of dysmenorrhea in 785 college women and nurses and found 47 per cent of the group to have painful menstruation.

Table I gives the findings in the menstrual histories of 2,282 women at the University of Minnesota.

TABLE I. MENSTRUAL HISTORY OF 2,282 UNIVERSITY WOMEN

	NUMBER OF CASES	PER CENT
Normal	1562	68.45 \pm 0.7
Dysmenorrhea	465	20.38 \pm 0.6
Irregular	236	10.34 \pm 0.5
Amenorrhea	19	0.83 \pm 0.2
Total	2282	100.00

Of the entire group, 20.38 per cent gave a history of painful menstruation, 10.34 per cent had irregular periods, and 0.83 per cent had amenorrhea. The groups with irregular menstrual periods and amenorrhea will not be discussed further as no significant variations were found.

With the exception of Miller's recent report, the amount of dysmenorrhea found among college women has been much less than that reported for hospital or office patients.

Table II shows the percentage of students who had dysmenorrhea in each age group.

There is a constant increase in the percentage of dysmenorrhea as the age increases up to the 20 year group. The increase from year to year up to 20 years of age is not sufficient to be of significance. However, the difference in the percentage of dysmenorrhea in each age group under 20 years and the groups over 20 years is great enough to be probably significant.

TABLE II. AGE AND DYSMENORRHEA

AGE IN YEARS	DYSMENORRHEA		
	NUMBER OF CASES	PER CENT	DIFFERENCE BETWEEN AGE GROUPS
17 or under	23	11.97 ± 1.6	
18	74	16.48 ± 1.2	-----4.31 ± 2.0
19	72	17.39 ± 1.3	-----0.91 ± 1.8
20	91	24.14 ± 1.6	-----6.75 ± 2.2
21 or over	205	24.12 ± 1.0	-----0.02 ± 1.9
Total	465	20.38 ± 0.6	

In Table III the percentage of students having dysmenorrhea have been grouped according to the year in college. A small group of student nurses are included in this table.

TABLE III. THE AMOUNT OF DYSMENORRHEA BY YEAR IN COLLEGE

		DYSMENORRHEA	
	TOTAL NUMBER	NUMBER	PER CENT
Freshmen	742	110	14.82 ± 0.9
Sophomore	521	127	24.38 ± 1.3
Junior	378	82	21.69 ± 1.5
Senior	447	116	25.95 ± 1.4
Graduate	19	7	22.58 ± 5.0
Nurses	86	6	6.98 ± 1.9
	<hr/> 2193	<hr/> 448	

The sharp increase from 14.82 per cent in the Freshmen group to 24.38 per cent in the Sophomore group is of definite statistical significance, the difference being 9.56 per cent ± 1.9. It is difficult to find a satisfactory explanation for this difference. It is possible that a change from the regularity of home life to the more or less irregular habits of hygiene of many college girls may in part account for this. On the other hand, for many students, college life may require greater regularity in habits of living than were practiced prior to college entrance. It is possible also that Freshmen show more reticence about recording menstrual pain than do the older students.

The group of 86 student nurses are included in this table because of the very low percentage (6.98 per cent) of dysmenorrhea found. The regularity of living and daily physical exercise necessary to this professional group may be partially responsible for the small number having menstrual pain.

Table IV presents the percentage of dysmenorrhea in relation to the size of town in which the student has lived most of her life. There is no significant difference in any of the groups. The very small rural

group seems to have less dysmenorrhea but the number is so small that one is not justified in drawing any conclusions.

Another factor obtained from the history of the student was the relationship between exercise and menstrual pain. At the time of the routine examination, each student was questioned by the examining

TABLE IV. SIZE OF TOWN AND DYSMENORRHEA

SIZE OF TOWN	DYSMENORRHEA	
	NUMBER OF CASES	PER CENT
Less than 50	3	10.34 \pm 3.8
50 - 999	57	19.8 \pm 1.6
1000 - 4999	72	17.02 \pm 1.3
5000 - 49,999	91	21.87 \pm 1.4
50,000+	209	21.28 \pm 0.9
	432	

physician about the amount of exercise taken and classified into one of three groups: no exercise—moderate exercise—excessive exercise.

Table V presents the findings in regard to exercise.

TABLE V. RELATION OF HISTORY OF EXERCISE AND MENSTRUAL PAIN

	NORMAL		DYSMENORRHEA		IRREGULAR	
	NO. OF CASES	PER CENT	NO. OF CASES	PER CENT	NO. OF CASES	PER CENT
No exercise	343	71.01 \pm 1.39	88	18.22 \pm 1.18	51	10.56 \pm 0.94
Moderate exercise	1210	67.67 \pm 0.74	375	20.98 \pm 0.64	185	10.35 \pm 0.49
Excessive exercise	6	85.71 \pm 8.92	1	14.29 \pm 8.92	0	
Total	1559		464		236	

The percentage of cases of dysmenorrhea in the group classified as taking excessive exercise is slightly lower than for the other two groups, although statistically the difference is not significant. This is due to the fact that there is only one case in the excessive exercise group. There is a slightly greater percentage of dysmenorrhea in the group taking moderate exercise than in that taking no exercise. It is an established fact clinically, however, that certain types of dysmenorrhea are distinctly benefited by physical exercise, although in the series presented, exercise or lack of it seems to have no relation to the amount of dysmenorrhea.

RELATIONSHIP BETWEEN POSTURE AND DYSMENORRHEA

There has been an assumption that poor posture is one of the many causes of painful menstruation. However, there has been no real basis for such a belief. Miller's^s recent study is a noteworthy contribution to this phase of the dysmenorrhea problem. In his series he found a decrease in the occurrence of dysmenorrhea coincident with improve-

ment in posture and muscle tone. He attributes this improvement to the effects of improved muscle tone on the circulation. As his group of cases without dysmenorrhea showed as much improvement in posture as those with dysmenorrhea, Miller states that the explanation of dysmenorrhea on a basis of posture is complicated and believes that muscle tone is more fundamental than posture.

TABLE VI. POSTURE AND DYSMENORRHEA

	TOTAL NUMBER	NORMAL		DYSMENORRHEA		IRREGULAR	
		NO. OF CASES	PER CENT	NO. OF CASES	PER CENT	NO. OF CASES	PER CENT
A	139	87	59.59 \pm 2.74	33	22.60 \pm 2.33	19	13.01 \pm 1.88
B	920	628	67.89 \pm 1.04	188	20.32 \pm 0.89	104	11.24 \pm 0.70
C	744	526	70.51 \pm 1.13	145	19.51 \pm 0.98	73	9.77 \pm 0.73
D	77	63	81.82 \pm 2.96	7	9.09 \pm 2.21	7	9.09 \pm 2.21
A+B	1059	715	66.76 \pm 0.96	221	20.63 \pm 0.83	123	
C+D	821	589	71.48 \pm 1.05	152	18.45 \pm 0.90	80	

In Table VI the percentage of cases of dysmenorrhea in four posture groups, A, B, C, and D, are presented. The posture ratings were given by the Department of Physical Education for Women and were based upon shadow pictures and a careful examination of the student by a member of the department.

In this series, there was a constant decrease in the percentage of dysmenorrhea as the posture became poorer. In the cases having A posture, 22.6 per cent had dysmenorrhea, while in those having D posture, 9.09 per cent had dysmenorrhea. This difference in percentage is large enough to be of statistical significance in spite of the fact that there were only 7 cases of dysmenorrhea in the D group. When the better posture or A and B groups are combined and the poorer posture or C and D groups are combined, the percentage of dysmenorrhea in the better posture group is slightly higher than in the poorer posture group, although the difference is not significant. It is of interest also to note that only 55 per cent of the normal group fall in the A and B posture classification, while 58 per cent of the dysmenorrhea group are classified as A or B. In this group of cases, it seems evident that posture has no relationship to dysmenorrhea.

RELATIONSHIP OF CERTAIN PHYSICAL FINDINGS TO DYSMENORRHEA

In 1847, Jacobi¹ called attention to the relation between general health and dysmenorrhea. In her series, 36 $\frac{1}{3}$ per cent of the group without menstrual pain had "poor health," while 61 per cent of the dysmenorrhea group had "poor health." The health rating was based entirely upon the patient's history and the number of miles the individual walked per day. Although this was an inexact method of measuring physical fitness, it is interesting that the observation was made that poor physical fitness might have some relation to menstrual pain.

Chisholm,⁹ in 1913, in reporting on the menstrual history of 293 schoolgirls notes the relation between anemia and weight and dysmenorrhea. In 23 cases with a hemoglobin of less than 80 per cent (Tallquist) 56.5 per cent had dysmenorrhea. She found no marked relationship between weight and menstrual pain.

Van Duyne⁷ cites 21 case histories of girls with dysmenorrhea giving certain physical findings. She noted no constant finding in the group except weak abdominal muscles.

In this study, four objective physical measurements were selected. These were systolic blood pressure, height-weight percentage (according to the Medico-Actuary tables), hemoglobin percentage and the vital capacity percentage according to height.

Chart 1 is a graphic representation of the percentage of dysmenorrhea occurring in each of three levels of systolic blood pressure, height-weight percentage, hemoglobin, and vital capacity percentage by height.

Systolic Blood Pressure.—24.14 per cent of the total group with a systolic blood pressure of 109 or less had dysmenorrhea while only 11.95 per cent of the group with a systolic blood pressure of 130 or more had dysmenorrhea. Chart 1 shows a constant decrease in dysmenorrhea as the blood pressure increases. The shaded area of each column represents the probable error of the percentage. It will be seen that the probable error is very small.

The data in Table VII further substantiates this. The mean systolic blood pressure for the dysmenorrhea group is 3.37 ± 0.38 lower than for the normal or group without menstrual pain.

Height-Weight Percentage.—Chart 1 indicates a decrease in the percentage of dysmenorrhea as the height-weight percentage increases. The greatest percentage of cases of dysmenorrhea occurred in the group 10 per cent or more underweight. In Table VII it is shown that the mean height-weight percentage is significantly lower for the dysmenorrhea group than for the nondysmenorrhea group.

Hemoglobin.—The hemoglobin readings were taken with a Tallquist hemoglobinometer. Turning again to Chart 1 it is seen that in the group with a hemoglobin of 69 per cent or less, the percentage of dysmenorrhea is the greatest and that there is a tendency for dysmenorrhea to decrease as the hemoglobin increases. The mean hemoglobin (Table VII) for the dysmenorrhea group is slightly lower than for the normal menstruation group. While the difference in the means is slight, 0.64 ± 0.20 , statistically it is probably significant.

Vital Capacity.—The graph of vital capacity (Chart 1) presents quite a different picture from that of the three preceding factors. The percentage of cases of dysmenorrhea increases slightly as the percentage of vital capacity increases. The mean vital capacity (Table VII) of the dysmenorrhea group is also slightly higher than that of the normal group although this difference is not significant.

It is evident from this data on certain objective measurements of physical fitness that the percentage of young women having dysmenor-

TABLE VII

	SYSTOLIC BLOOD PRESSURE		HEIGHT-WEIGHT PER CENT		HEMOGLOBIN		VITAL CAPACITY	
	MEAN	STANDARD DEVIATION	MEAN	STANDARD DEVIATION	MEAN	STANDARD DEVIATION	MEAN	STANDARD DEVIATION
Normal	119.23 \pm 0.20	11.56 \pm 0.14	98.97 \pm 0.20	11.68 \pm 0.14	78.56 \pm 0.09	5.44 \pm 0.07	92.53 \pm 0.20	11.64 \pm 0.14
Dysmenorrhea	115.86 \pm 0.32	10.23 \pm 0.23	96.61 \pm 0.35	11.10 \pm 0.25	77.92 \pm 0.18	5.73 \pm 0.13	92.73 \pm 0.36	11.60 \pm 0.26
Difference of Means	3.37 \pm 0.38		2.36 \pm 0.40		0.64 \pm 0.20		0.20 \pm 0.41	

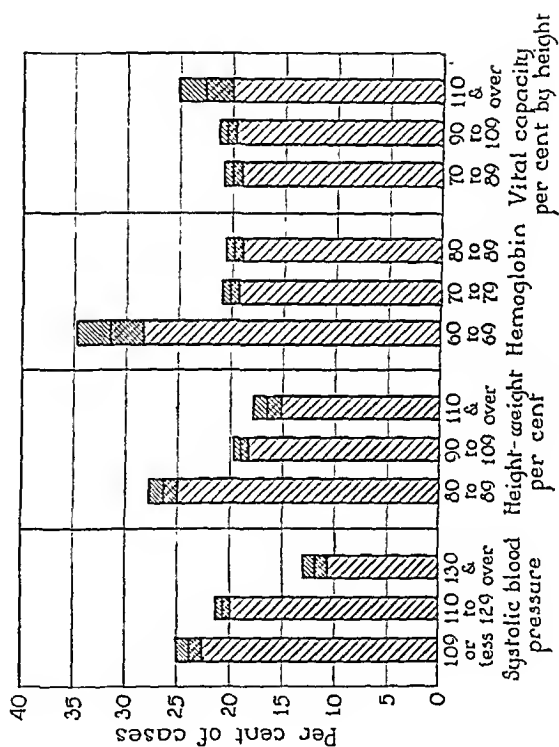


Chart 1

rhea is greatest in the groups having the lowest blood pressure, the lowest height-weight percentage and the lowest hemoglobin percentage.

Nervous Tension.—It is contended frequently that the high strung or nervous woman is more prone to menstrual pain than is the more emotionally stable person. Obviously, it is impossible to obtain objective data to either prove or disprove such an assumption. Physicians examining the subjects of this study checked as "high strung" each individual who appeared emotionally unstable.

TABLE VIII

	HIGH STRUNG		CONTROL	
	NUMBER	PER CENT	NUMBER	PER CENT
Normal	56	57.2 \pm 3.4	1517	52.5 \pm 0.6
Dysmenorrhea	29	29.5 \pm 3.1	1137	39.7 \pm 0.6
Irregular	13	13.3 \pm 2.3	230	7.8 \pm 0.3
	98	100.0	2884	100.0

Table VIII shows that 98 women were classified as "high strung" while 2,884 were not so classified and are therefore used as a control group. The menstrual histories of those described as "high strung" placed 57.30 per cent in the normal group and 29.51 per cent in the dysmenorrhea class, whereas, 52.5 per cent of the control group had normal menstruation and 39.7 had menstrual pain. Thus, the control group showed a significantly higher percentage of dysmenorrhea than did the "high strung" group. It seems evident that those students who were observably "high strung" had not as great a tendency to dysmenorrhea as had those who seemed to have less nervous tension.

SUMMARY

1. The incidence of dysmenorrhea in 2,282 University women was 20.38 per cent.
2. The percentage of dysmenorrhea increased as the age increased up to twenty years of age, with a significant increase between the groups under twenty years and those over twenty years of age.
3. The incidence of dysmenorrhea was lowest in the Freshman year. In a small group of student nurses the percentage of dysmenorrhea was 6.98 per cent compared to 20.38 per cent for the University women.
4. The size of town in which the student has lived has no relation to dysmenorrhea.
5. The amount of physical exercise as reported by the student has no significant relationship to dysmenorrhea.
6. Posture has no significant relation to dysmenorrhea, although the percentage of dysmenorrhea in the poorer posture groups was lower than in those with better posture.
7. The mean systolic blood pressure, the mean height-weight percentage, and the mean hemoglobin percentage was significantly lower

for those having dysmenorrhea than for the group who have not. The mean vital capacity percentage was slightly higher for the dysmenorrhea group. The percentage of cases having dysmenorrhea was greatest in the lowest blood pressure group, the lowest height percentage group and the lowest hemoglobin group.

8. The percentage of dysmenorrhea occurring in a group of students who were classified as "high strung" was lower than in a control group not so classified.

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THE OBSTETRIC TRANSVERSE DIAMETER

THE SIGNIFICANCE OF ITS MEASUREMENTS BY X-RAY PELVIMETRY*

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THE commonly employed methods of pelvimetry do not enable us to measure either the anteroposterior or the transverse diameters of the pelvic inlet in a direct manner. Estimates of their length are, therefore, subject to an unavoidable source of error which may be significant whenever the measurements so obtained are shorter than normal. Since there is not even an indirect method of measuring the transverse diameter by internal pelvic examination, an estimate of its length is particularly unreliable as it is based entirely upon the external transverse measurements of the false pelvis. There exists, consequently, a mistaken tendency to think chiefly in terms of the computed true conjugate as indicative of the size of the pelvic inlet; practically all suggestions for the management of labor complicated by contracted pelvis being based on different lengths of this diameter. This fallacy is immediately apparent when one considers that we cannot describe the size of any passageway by mentioning only one of its dimensions.

X-ray pelvimetry provides us with the only means of measuring all the inlet diameters accurately. Its value is evident and assumes added significance because the pelvic inlet far more frequently offers serious obstruction to delivery than does the pelvic outlet. Since its introduction, attention has again been directed to the equal significance of the

*Read at a meeting of the St. Louis Medical Society, April 7, 1931.

se, as well as the anteroposterior diameter, as a measure of the capacity, and in this lies its greatest contribution.

Measuring of the transverse diameter of the inlet, one usually has to see to what actually constitutes its greatest transverse diameter. In contracted pelvises, however, this lies in such proximity to the sacrum that it becomes unavailable for the passage of the largest of those diameters of the fetal head which must pass transversely through the pelvic inlet. Under these circumstances, a transverse diameter located at a certain relatively fixed distance anterior to the sacral promontory is the truly significant one, and has been called the greatest available or obstetric transverse diameter. Few authors have defined its position and those who have believe it to be located midway between the symphysis and sacral promontory. We, however, believe that this is de-

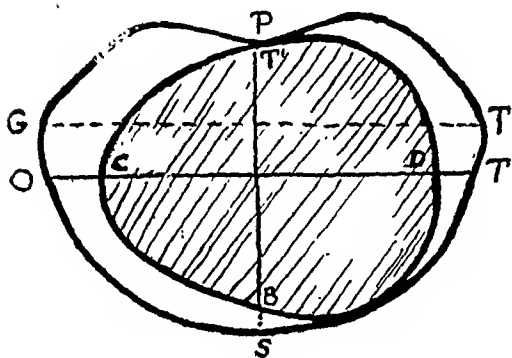


Fig. 1

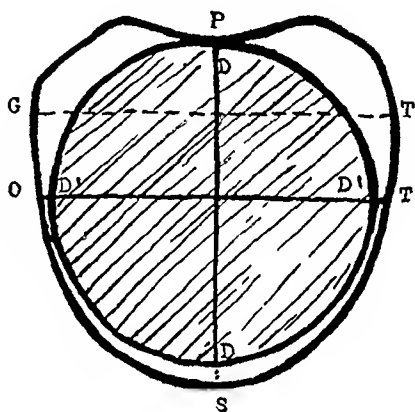


Fig. 2

Fig. 1.—*PS*, true conjugate. *BT'*, bitemporal diameter. *CD*, greatest cephalic diameter presented transversely. *GT*, greatest transverse diameter. *OT*, obstetric transverse diameter.

Fig. 2.—*PS*, true conjugate. *DD* and *D'D'*, equivalent to suboccipitobregmatic and biparietal diameters. *GT*, greatest transverse diameter. *OT*, obstetric transverse diameter.

termined by the most posterior position that could be assumed by the largest of those cephalic diameters which present transversely as the head enters the inlet. In simple flat pelvises this prevails when the head lies transversely in the inlet and in contact with the sacrum. In this position one parietal boss will occupy the concavity to one side of the sacral promontory and the bitemporal diameter, measuring 8 cm., will be presented for passage through the true conjugate. The longest transversely presenting cephalic diameter bisects the bitemporal diameter and will lie 4 cm. anterior to the promontory (Fig. 1).

In the case of a generally contracted pelvis, the head is in acute flexion and centrally placed when entering the inlet. In this attitude its presenting circumference is practically round, being determined by its suboccipitobregmatic and biparietal diameters, both of which measure 9.5 cm. An entirely similar cephalic diameter is presented for passage through the true conjugate regardless of the pelvic segment toward which the occiput is directed. Such a diameter is 9.5 cm. long when the

true conjugate measures 9.5 to 10 cm. but is equal to the latter diameter when, by a process of molding, it has been enabled to pass through a shorter true conjugate. In either circumstance, it is bisected by the longest transversely presenting cephalic diameter which latter will lie most posteriorly in relation to the inlet when the head is in contact with the sacral promontory. The point of bisection will then be 4.75 cm. anterior to this point when the true conjugate is 9.5 to 10 cm. long, and midway between the symphysis and promontory when the true conjugate measures less than 9.5 cm. (Fig. 2).

The obstetric transverse diameter is, therefore, for all practical purposes, located midway between the symphysis and promontory in gen-

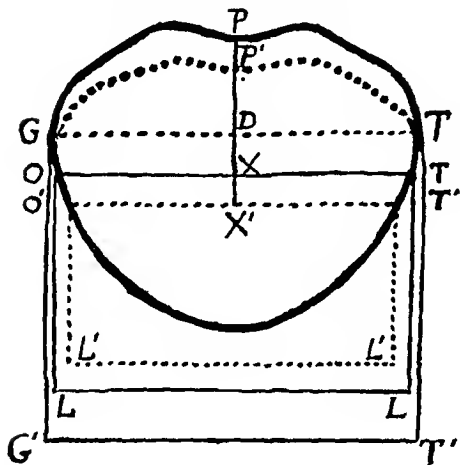


Fig. 3

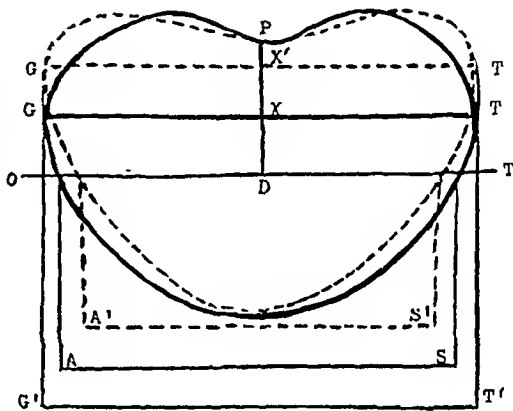


Fig. 4

Fig. 3.—To show effect of shortening of the true conjugate. PP' , promontory. GT , greatest transverse diameter. PD and $P'D$, distance of greatest transverse from promontory. X and X' , points at equal distances from P and P' respectively. OT and $O'T'$, obstetric transverse diameters at these points. $L'L'$ and LL , length of $O'T'$ and OT . $G'T'$, length of GT . As true conjugate becomes shorter, distance PD decreases and difference between $G'T'$ and LL increases.

Fig. 4.—Showing effect of increased curvature of ileopectineal line in region of sacroiliac synchondrosis. P , promontory. ODT , transverse diameter at fixed distance from P . PD , distance of ODT from P . GT , greatest transverse diameters of the two pelvic inlets. PX and PX' , distances of GT from P . AS and $A'S'$, length of available transverse space at ODT . $G'T'$, length of greatest transverse diameter. As curvature increases, AS and PX decrease and difference between $G'T'$ and AS increases.

erally contracted pelvis and 4 cm. anterior to the latter point in simple flat pelvis.

In our study of the pelvic inlet, we have employed the method of x-ray pelvimetry developed by Thoms. We find that the greatest transverse diameter tends to lie closer to the promontory and that the difference between its length and that of the obstetric transverse tends to increase as the true conjugate decreases. In other words, the lengths of the obstetric transverse diameters of pelvis whose greatest transverse diameters are essentially equal to one another will tend to decrease as the true conjugate becomes shorter (Fig. 3).

Variations in the contour of the pelvic inlet also have an important influence upon these diameters. When comparisons are made between

pelves whose greatest transverse and true conjugate diameters are respectively equal to one another, it is seen that the actual and relative length of the obstetric transverse is shorter the more acute the curvature in the region of the sacroiliac synchondrosis (Fig. 4).

While it is true that under similar conditions the greatest transverse diameter tends to lie closer to the sacral promontory, yet it is incorrect to attribute any differences in the obstetric capacities of such pelves to the slightly increased amount of encroachment of the sacral promontory upon this diameter. The underlying cause is to be found in differences in the lengths of the obstetric transverse diameters, these being dependent upon variations in the shape of the inlet of any two such pelves under consideration.

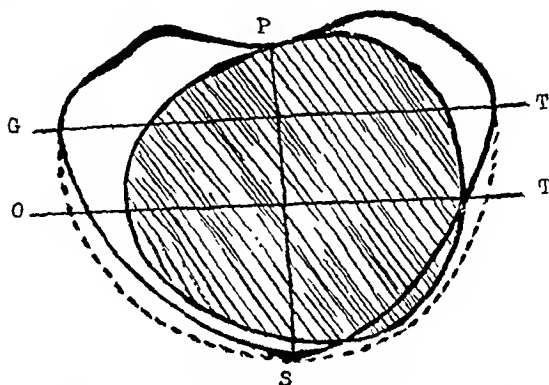


Fig. 5.—*PS*, true conjugate. *GT*, line of the greatest transverse diameter. *OT*, line of the obstetric transverse diameter.

Whereas a given true conjugate may be sufficiently long to permit the passage of an average sized fetal head when the obstetric transverse diameter is of one length, it may not be sufficiently long to permit of such an outcome with a somewhat shorter obstetric transverse, regardless of the length of the greatest transverse diameter (Fig. 5). This indicates that it is necessary to consider not only the actual length of the true conjugate and obstetric transverse diameters, but also their relationship to one another, in order to determine what we choose to call the obstetric capacity of any contracted pelvic inlet.

From the foregoing, it is evident that no reliable deductions of the length of any specifically located transverse diameter of the inlet can be drawn from the length of either the external measurements or from the greatest transverse diameter of the inlet itself. It would, therefore, seem proper to differentiate between simple flat and generally contracted pelves on the basis of the length of a transverse diameter located 4 cm. anterior to the promontory. This represents the location of the obstetric transverse diameter of a simple flat pelvis and by comparison with the location of the similar diameter of a generally contracted pelvis is, of the two, the nearer to the promontory. Accordingly, the diagnosis of a generally contracted pelvic inlet would appear warranted when, in pelves having a true conjugate of 10 cm. or less, the transverse diameter lo-

eated 4 cm. anterior to the promontory measures 11.5 cm. or less. The diagnosis of a simple flat pelvis would be warranted when, with a true conjugate of 9.5 cm. or less, the transverse diameter located 4 cm. anterior to the promontory measures more than 11.5 cm.

In Table I are tabulated the measurements of the accompanying illustrative case reports.

TABLE I

CASE		1	2	3	4
Interspin.		21.5	24.5	19	20.5
Intercrest.		24	29	23	24.5
Intertroch.		27.5	32	27	29
Ext. Conj.		16.5	19	15	17
Bituberous		10	10	10.5	9
Diag. Conj.		11	10.5	11.5	11.5
True Conj.		9.5	9	10	10
By X-Ray	T.C.*	8.8	8.8	9.5	10.5
	G.T.I.	13	12.5	12.25	12
	O.T.	12.5	10.5	11.25	11.75
	X	2.75	2.25	3.00	3.50

*T.C., true conjugate. G.T.I., greatest transverse of inlet. O.T., obstetric transverse. X., distance of greatest transverse from promontory.

CASE 1.—This is interesting in that the measurements obtained by ordinary methods of pelvimetry indicate a diagnosis of a generally contracted pelvis to be warranted. X-ray pelvimetry shows perfectly normal transverse inlet measurements, whereas the actual true conjugate is shorter than otherwise indicated. This pelvis should be classified as simple flat.

CASE 2.—The measurements usually taken indicate this pelvis to be of the simple flat variety. X-ray pelvimetry would seem to confirm this diagnosis if the greatest transverse diameter were a proper index of its width. There is, however, a sharper curvature in the region of the sacroiliac synchondrosis causing an increased degree of anterolateral flattening of the inlet, so that the obstetric transverse is 2 cm. shorter and the space available for the passage of the fetus obviously less than in Case 1. On this basis, this pelvis should be classified as of the generally contracted variety. From a practical standpoint, it is interesting to note that this patient had three previous difficult labors in each of which the fetus died as a direct result. She was seen for the first time after the onset of her present labor which terminated in the spontaneous delivery of a normal-sized living child presenting a deep groove over one parietal bossa and giving evidence of slight intracranial injury. With the size of the fetus estimated as being normal, pelvic measurements obtained by the usual methods certainly would have warranted a test of labor. However, x-ray pelvimetry postpartum, certainly explains the difficult labors and together with the history in-

dicates that elective cesarean section should have been performed. This is true in spite of the more or less favorable present outcome.

CASE 3.—The measurements obtained by ordinary pelvimetry indicate generally contracted pelvis of rather extreme degree. X-ray pelvimetry shows a true conjugate actually smaller than otherwise indicated and although the lateral contraction is not

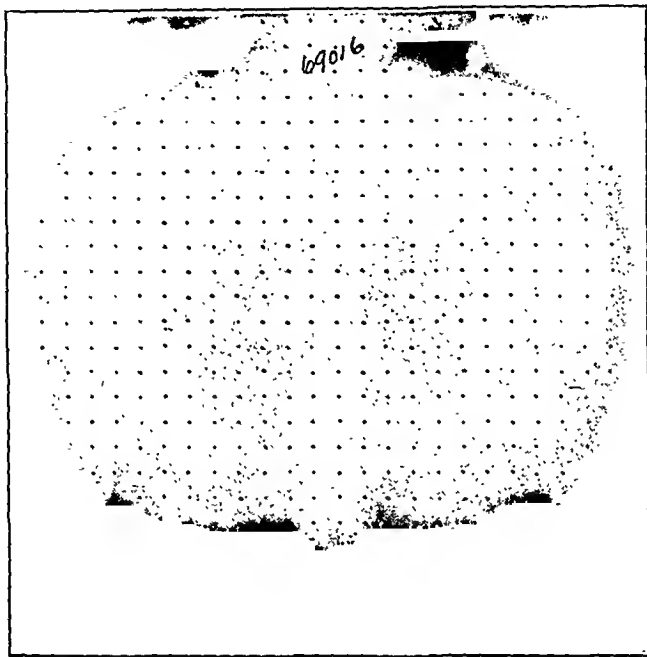


Fig. 6.—Case 1

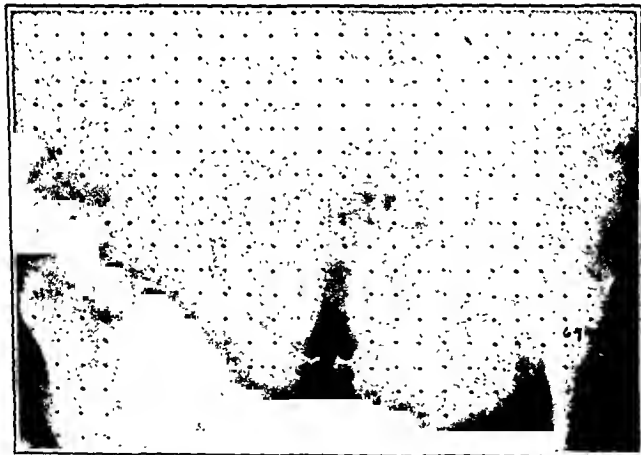


Fig. 7.—Case 2

as extreme as one may have been led to believe, the diagnosis of pelvic type is confirmed. A matter of far greater importance is that determination of the obstetric capacity of the inlet gives the attendant a greater degree of confidence in the probable result to be obtained by permitting the patient to have a test of labor. A normal child, weighing 3150 gm., was born spontaneously after a relatively easy labor.

CASE 4.—A seventeen-year-old primipara in whom ordinary measurements most definitely indicate a generally contracted pelvis of moderate degree. Because of the presence of a large fetus, the head of which was not deeply engaged at the onset

of labor, the possible desirability of performing cesarean section was considered by the physician in charge. However, determination of the obstetric capacity of the inlet by a study of the relationship between the length of the true conjugate and that of the obstetric transverse diameter, indicated that a trial of labor was justifiable, and that indeed these measurements were but slightly short than normal. Spontaneous delivery occurred after a short labor, the child weighing 4330 gm. and presenting the following measurements: biparietal 9 cm., bitemporal 8 cm., occipitomenal 14.25, occipitofrontal 11.5 cm., suboccipitobregmatic 10.5 cm.



Fig. 8.—Case 3



Fig. 9.—Case 4

We have mentioned the fact that when the true conjugate is shortened it is essential not only to measure the obstetric transverse but also to study the relationship of these two diameters to each other. This relationship, expressed in terms of the sum of these two diameters, determines the obstetric capacity of the inlet and may be called its "obstetric index." A definite statement as to the lower limit of a normal index value can only be made after a study of the outcome of labor in a very large series of contracted pelvises, and even then may have to be in-

less from shortness of breath resulting from interference with the motility of the diaphragm by the enlarged uterus. DeLee¹² has written that the high position of the diaphragm in pregnancy augments the respiratory difficulty and cyanosis.

Sir James Mackenzie¹³ in discussing the cardiopath in pregnancy makes a very significant statement in regard to posture and one with which the author is in complete accord. He points out that it is necessary to understand the physiology of the cardiorespiratory system, and to be able to recognize the early manifestations of cardiac failure, and institute prompt treatment. His opinion on the prognosis of the cardiopath is based upon the response of the heart to certain tests. When the slightest evidence of cardiac failure occurs, he recommends that, "She should be encouraged to sit up or to be propped up in bed, since lying down, by restraining the movements of the ribs, tends to hamper the circulation of the bases of the lungs."

The importance of avoiding the supine posture was brought to the author's attention by one case in 1922. The prophylactic value of this measure was confirmed in another case in 1930, which stimulated this inquiry into the value of the semirecumbent posture as a prophylactic aid. Two cases will be briefly given.

CASE 1.—Mrs. P. T., twenty-four years of age. Primipara. History of no importance, except of an attack of tonsillitis in 1919, and followed by a mitral lesion. Expected labor December 25, 1921. Patient would not heed prenatal instructions, and was extremely active. On December 15, she developed cardiac failure. She was treated by the usual methods, and since labor was overdue, and the patient in good condition, induction was advised. On January 9, 1922, the patient entered the Mount Sinai Hospital. Diagnosis: L.O.A., head low in the excavation, postmature, complicated by mitral stenosis. At 6:30 P.M., the patient was placed in the lithotomy position, and without an anesthetic (on account of the previous cardiac asthma), the cervix was stretched with a Goodell dilator, the lower uterine segment, cervix and the vagina were packed with plain gauze. At the end of the operation the patient suddenly became markedly cyanotic and dyspneic, expectoration of a frothy blood-tinged sputum, skin cold and clammy. Temperature 98.8°, pulse 80, weak and irregular, and respirations 40. Diagnosis: pulmonary edema due to cardiac failure. The packing was removed, and the patient was treated for the cardiac condition. Patient improved, and labor set in on January 13. On January 15, at 5:15 A.M., temperature 98.8°, pulse 82, and respirations 32; effacement and dilatation complete and the head low in the pelvic excavation. Low forceps, left episiotomy and an easy extraction accomplished under light gas oxygen anesthesia in the lithotomy position. Placenta delivered at 5:50 A.M., by expression. A living child weighing 2435 grams was delivered which died on the sixth day from bronchopneumonia. The puerperium was uneventful, temperature ranging from 97.4° to 99.4°, pulse from 50 to 82, and the respirations from 20 to 28. The patient was discharged from the hospital on the sixteenth day postpartum.

The patient was seen on September 13, 1922 and was found to be pregnant about eight weeks. Expected labor April 30, 1923. During this pregnancy the patient followed prenatal instructions carefully. During the pregnancy the patient's condition was good with occasional mild attacks of dizziness and dyspnea, pulse between 80 and 92, blood pressure 78 to 90 systolic, and 45 to 65 diastolic, until April 18. She began to complain of dizziness and dyspnea and spots before the eyes on slight exertion which was relieved by rest in bed. Pulse 80 and of fair quality, blood pressure 87/45, breath sounds clear over the bases of the lungs. Diagnosis: L.O.A., pregnancy about thirty-eight weeks, complicated by mitral stenosis and an oncoming cardiac failure, induction of labor was decided upon. The patient was digitalized,

and on April 24 she was placed in a semirecumbent position, and a bag was introduced into the uterus. On April 26, the bag was removed on account of no uterine contractions. Uterine contractions set in on April 28, and on April 30, at 3:15 A.M. effacement and dilatation were complete, with the patient in a semirecumbent position of about 45 degrees; under a light ether anesthesia, low forceps, and a left-

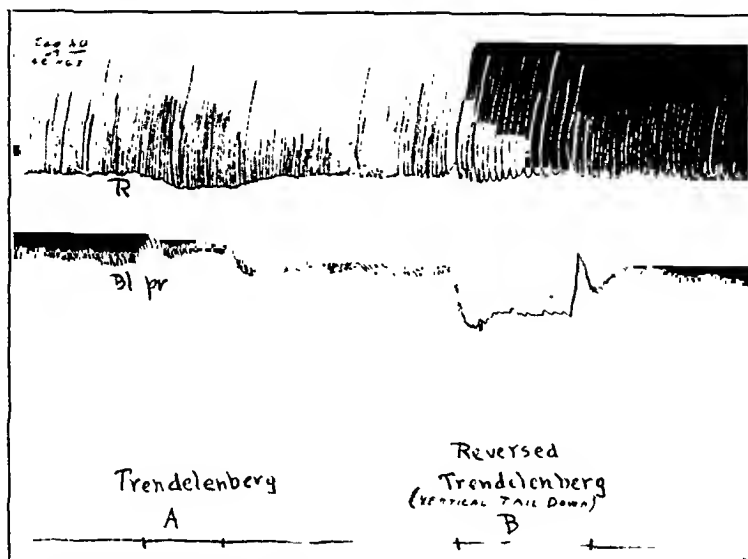


Fig. 1

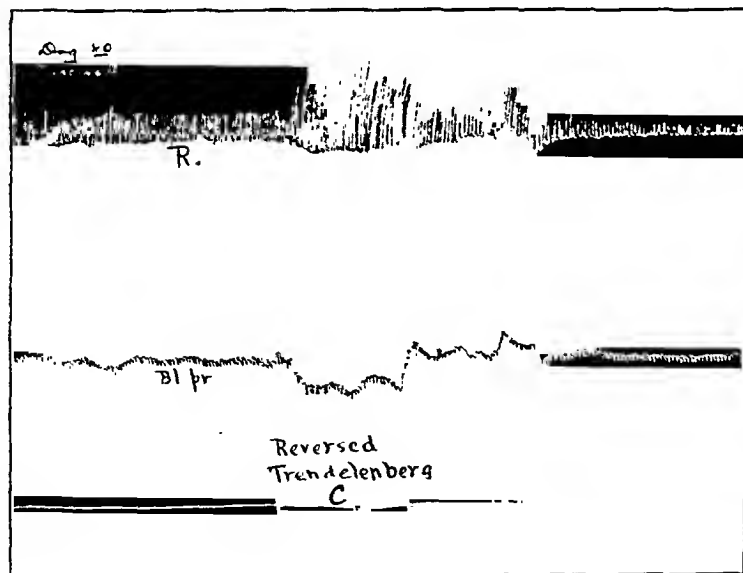


Fig. 2

Figs. 1, 2, 3.—The tracings show the respiratory rate and the blood pressure in changing the position of an experimental dog from the horizontal position to, (A), Trendelenburg position. The respiratory rate and blood pressure is increased. (B) Reversed Trendelenburg (Vertical tail-down) position, dyspnea and a fall in blood pressure. (C). Reversed Trendelenburg position, dyspnea and fallen blood pressure. (D). Trendelenburg position, increased in the respiratory rate and blood pressure. (E). Reversed Trendelenburg position, dyspnea and fall in blood pressure. It will be noticed that in the changes in position from the horizontal position to the positions at A to E that the blood pressure is dropping, which demonstrates the effect of the mechanical factor on the heart.

sided episiotomy, delivery was easily accomplished of a living male child weighing 3225 grams. Placenta expressed at 3:50 A.M. The postpartum course was uneventful, the temperature ranging between 97.6° and 99.4°, pulse from 64 to 88, and the respirations from 18 to 28. Patient was discharged from the hospital on the twelfth day postpartum.

CASE 2.—Mrs. G. H., twenty-six years of age. Multiparac. The patient was seen through the courtesy of Dr. G. K. Rosenweig. Patient was about eight weeks pregnant, cyanosis of the lips and fingers marked, dyspnea, pulse 100, presystolic murmur and an enlarged heart and moist râles over the bases of the lungs. A palpable adenoma of the isthmus of the thyroid.

Diagnosis.—Pregnancy, cardiac failure due to mitral stenosis, and a possible toxic adenoma of the thyroid. An evacuation of the uterus was done on January 31, 1928, in the lithotomy position under gas-oxygen anesthesia. The patient reacted well, and was discharged from the hospital on February 8. The basal metabolic rate six weeks postpartum was plus 8. Patient was advised to be sterilized at a future date.

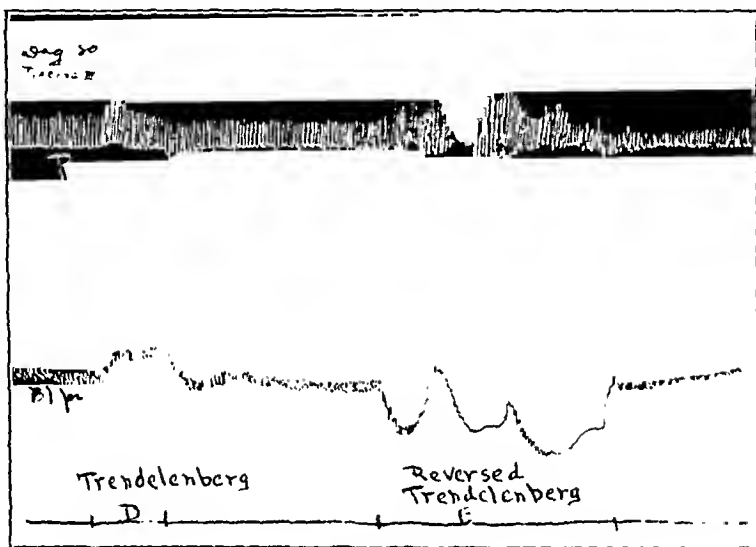


Fig. 3

In view of the fact that the cardiac failure was due to the toxemia in early pregnancy, evacuation of the uterus was done, but if cardiac failure occurs later in pregnancy it should be treated first.

The patient was seen again November 1, 1930, and found to be pregnant about eight weeks. The patient stated that she had been enjoying good health, and was desirous of having another child. Evacuation of the uterus was advised. On November 5, the patient was placed in the lithotomy position, and while being prepared, she suddenly became markedly cyanotic and dyspneic. The patient was placed in a sitting position for about thirty minutes when the cyanosis and dyspnea disappeared. She was placed in a semirecumbent position of 45 degrees, and under gas-oxygen anesthesia the evacuation of the uterus was completed with no further evidence of cyanosis or dyspnea. She was kept in a semirecumbent position for three days and discharged on November 10.

COMMENT

The cardiorespiratory system is interfered with by posture due to the gravid uterus interfering with respiration. The respiratory interference

has been shown by Yandell Henderson to affect cardiac function, and with its resultant decrease of the flow of blood to the heart, brings about a stagnation of blood in the splanchnic vessels, so that gravity shock may occur during labor, and particularly after the delivery of the child, collapse and death may occur. I feel convinced that most of the cases of collapse and death of the cardiopath is due to gravity shock, and is the factor that must be prevented during pregnancy and labor.

During pregnancy the patient should be advised to sleep in a semi-recumbent position in order to avoid interference with the excursion of the diaphragm, and so interfere with respiration.

During labor the patient should be kept in a sitting posture. The delivery should be accomplished in the same posture, and prophylactic forceps done in the second stage of labor in all cardiopaths. Immediately after the delivery of the child sandbags should be applied to the abdomen to prevent splanchnic engorgement. Pituitrin is given as necessary, as well as ergot. The patient should be kept in a sitting posture for at least three days, and gradually brought back to a recumbent position while noting the effect on the cardiorespiratory system.

Vital capacity should be ascertained as a routine in the prenatal examination as an early gauge of myocardial insufficiency.

SUMMARY

The principles involved in the management of the cardiopath on the basis of the author's experience are: (1) a thorough knowledge of the cardiorespiratory physiology as related to posture; (2) the use of every known aid in relieving the embarrassed heart of avoidable strain; (3) to obtain the opinion of a cardiologist as to the condition of the cardiorespiratory apparatus, keeping in mind that the obstetrician on the basis of his obstetric judgment must decide when and how to interfere in a given case for the safety of the patient.

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(For discussion, see page 610.)

PLACENTA CIRCUMVALLATA. A THEORY OF FORMATION
INCLUDING RELATIONSHIP TO NORMAL PLACENTA, TO
PLACENTA MARGINATA AND TO PLACENTA MEM-
BRANACEA. PRELIMINARY REPORT*

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University of Chicago)*

MUCH study has been spent on placentation in relation to anomalous location or site such as results in various types of ectopic pregnancy, tubal, ovarian, abdominal, etc. Practically no thought has been given to the subject of the area over which placentation may take place or the changing relation of the size of the placenta to that of the uterine cavity as pregnancy advances. This is remarkable because of the complications which may arise from having too small or too large an area over which the placenta extends in the early months of pregnancy. This subject deals entirely with too large an area.

The first question to arise will be, is there a possibility of having too great an area of placentation. We know of one condition in which this is definitely proved; i. e., placenta membranacea where the fetus at term is entirely surrounded by active placenta except at one small area over which stretch the membranes composed of amnion, chorion laeve and decidua capsularis. This condition represents almost the extreme area over which the placenta could occur and must originate in the early months of pregnancy following which the placenta is distended as the gestation sac enlarges. On the other hand, placentation usually extends over merely a small area of one wall or side of the uterine cavity (it has been stated one-fourth of total area of uterine cavity) so that as the cavity enlarges the area covered grows gradually into that of a normal full-term placenta without undue stress or strain.

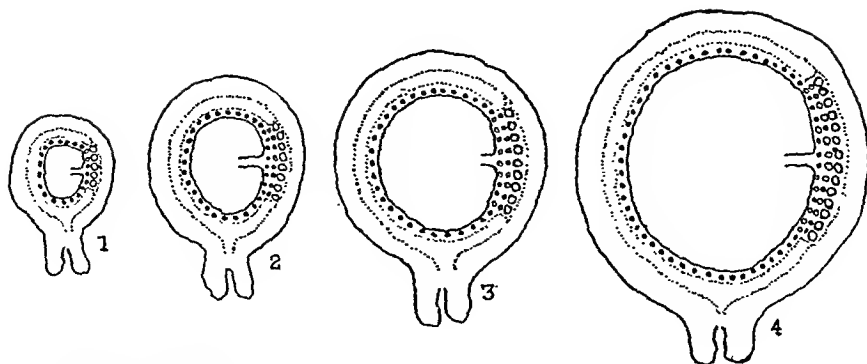
Placentation occasionally must extend over an area larger than normal in the early months because in placenta membranacea it extends over almost all the cavity. What happens to the excess placenta when short of producing a membranaceous placenta; in other words what becomes of the excess marginal tissue? While we may see a full-term placenta extend over nearly all the uterine cavity, we never see one which extends over only half. Something must occur to reduce this, else we would see not infrequently a hollowed out hemispherical placenta at term, one never described to my knowledge.

Consider now what must occur in such a condition. As the fetus enlarges it bulges more and more into the membranes because they are more distensible than the complicated fixed structures in the placenta. Now as the nonplacental portion of the uterine muscle is stretched more than that over the placenta there arises a tension at the margin of the

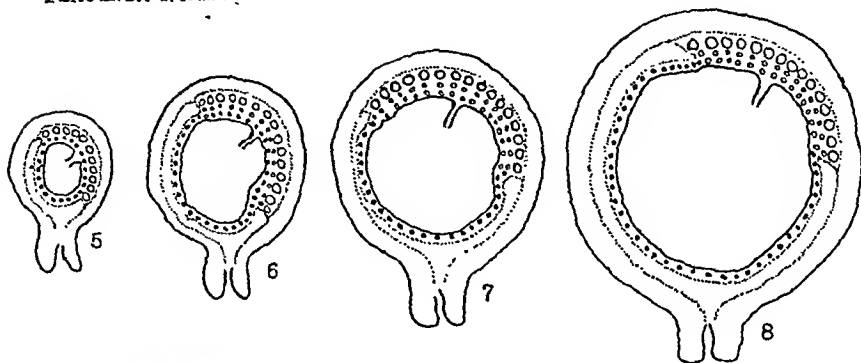
*Read at a meeting of the Chicago Gynecological Society, May 15, 1931.

placenta caused by the tendency for the muscle to stretch off of the relatively rigid placenta. This constant tension aided probably by Braxton-Hicks' contractions ruptures the fine marginal decidual vessels, causing ultimate atrophy of the associated villi which gradually retract into a fibrous ring always at the margin of the placenta. This tension continues until the placenta is reduced to the proper size to care for the optimal nourishment of the fetus. Such a placenta at term is known as placenta marginata.

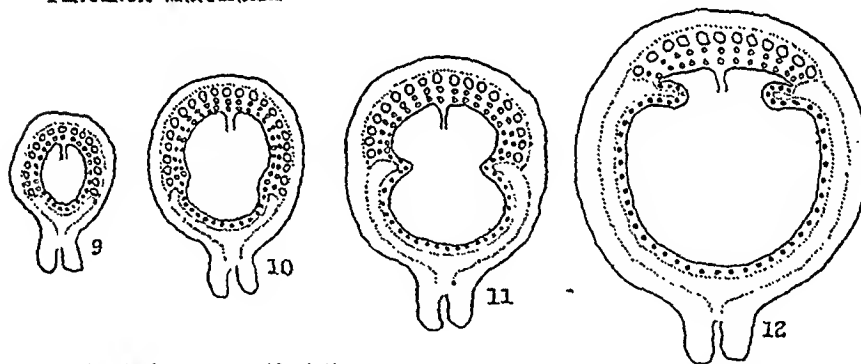
Let us now suppose that early placentation extends over more than half the cavity of the uterus. If the placenta covers not too large an area of the uterine cavity the tension of the growing fetus on the membranes is such that it protrudes from the placental cavity into the more distensible cavity surrounded by the membranes. Now as tension on the muscle wall over this area increases, there is a tendency for the muscles to slip off the margin of the placenta causing a so-called "infaret" ring as above described. This fibrous ring cannot expand. As the fetus enlarges it gradually herniates from the relatively rigid nondistensible cavity surrounded by the placenta into the freer distensible cavity of the expansible membranes. The tension on the muscle covering this latter cavity increases and the pull of the muscle tending to slip off the margin of the placenta continues. Consequently there is a slow separation of the margin of the placenta as the ring traverses back over the emerging fetus. This separation takes place through the decidua so that a layer of the latter covers the anterior surface of the "infaret" ring as is found in all specimens and was ever a source of considerable difficulty in explaining its presence in this position. As the extraplacental cavity is enlarged by the growth of the fetus, the ring with its veil is gradually approximated to the placenta and is found in various stages of agglutination and in various stages of obliteration of its component parts depending on the pressure and the time elements. Such a placenta at term is known as placenta circumvallata. The veil in the best preserved specimens then is composed as follows from its maternal to its fetal surface: (1) amnion, (2) chorion frondosum atrophied into so-called "infaret" ring or white necrosis of villi, (3) a thin layer of decidua (torn loose from the decidua basalis at the margin), (4) a thin layer of decidua capsularis, (5) chorion laeve, (6) amnion. The ring, the annulus fibrosus, is composed of the "infarcted" atrophic and often obliterated chorion frondosum with a thin layer of decidua basalis from the uterine wall external to the remaining active placenta. If the muscle tension is greater on one side of the herniating cavity as the fetus emerges from the "placental cup" into the cavity surrounded only by the membranes, there is formed an eccentric ring or simply a ring fold on one margin only, the muscle tension having been greater here, more "infarction" occurs at this point. Such results are frequently seen in partial placenta circumvallata and in partial placenta marginata or in combinations of the two.



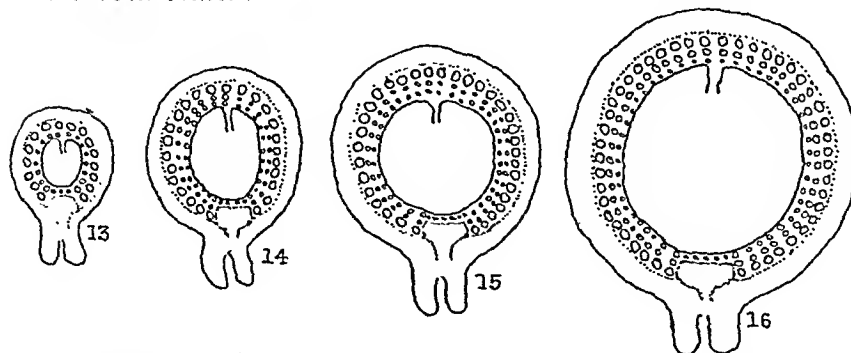
PLACENTA NORMAL



PLACENTA MARGINATA



PLACENTA CIRCUMVALLATA



PLACENTA MEMBRANACEA

Fig. 1.—Schematic chart illustrating development of the placenta in the four theoretically possible types of extent of area of early placentation. In all figures the uterine wall is represented by outside unbroken line; decidua by fine dotted line; dead chorionic villi of chorion laeve or of the "infarct ring" by heavy black dots; active chorionic villi by small circles and amnion by inner unbroken line. 1, 5, 9, 13 represent the early stages of the four types, respectively; while 4, 8, 12, 16 represent the terminal stages. 5 to 8 and 9 to 12 outline the theoretical reduction in the relative size of the placenta as gestation advances with formation of the "infarct rings" as labeled.

If the extent of the early placenta is such that the fetus cannot make enough pressure on the small surface of the membranes to grow out of its placental inclosure it must needs distend it which apparently occurs in placenta membranacea. Probably most of these feti do not survive.

The idea so far embodied may be stated in various ways. The four forms noted, normal placenta, placenta marginata, placenta circumvallata and placenta membranacea are the results respectively of the degree of extent of area of early placentation. Placenta marginata and placenta circumvallata are merely the result of atrophy of the marginal chorionic villi covered by a thin layer of decidua basalis from which the muscle and outer layer of decidua have been pulled off, giving rise to the annulus fibrosus which has caused difficulty in former theories. It may also be stated thus: placenta marginata and placenta circumvallata are the results of the effort of nature to convert excess placental tissue into passive membranes. They each contain the same elements and ordinarily the line of demarcation is determined early. However, it is not unreasonable to expect a certain per cent of error in its early determination due probably to excessive vascularization of the decidua in certain locations in the uterus.

Assuming that the foregoing theory represents the facts, it is suggested that normal placenta results when the fertilized egg embeds in the decidua of the relatively flat anterior or posterior wall of the uterus in which case there is decidua basalis roughly on one side of the ovum only; that placenta marginata results when it embeds in the decidua at the extreme lateral margin of the cavity where the anterior wall reflects onto the posterior wall in which case there is decidua basalis roughly on two sides of the ovum and that placenta circumvallata results when it embeds in one of the uterine cornua in which case decidua basalis occurs roughly on three sides. If the egg should embed far enough in the depression of the horn there might result placenta membranacea; still farther would result in uterointerstitial pregnancy (Klebs). Indeed it is possible that as placenta membranacea is very rare, it may be the end-product of an interstitial pregnancy implanted close to the uterine cavity but still deep enough for a good maternal blood supply to all sides of the ovum. The chorion frondosum and subsequently placenta develops over the whole ovum and then the further growth of the gestation sac gradually takes place into the uterine cavity.

If the theory represents the facts a study of a series of midterm pregnant uteri, Porro operation or necropsy specimens hardened before mutilation should show a variation in relative area of placentation; about 85 per cent extending over possibly one-fourth of the uterine cavity; about 14 per cent should have placenta extending over approximately one-half of the uterine cavity and about 1 per cent or 1.5 per cent with the placenta extending over about three-fourths of the uterine cavity. This is about the ratio of occurrence of normal placenta, placenta marginata and placenta circumvallata given in Williams' comprehensive review of the subject. Placenta membranacea is very rare, only a few cases having been reported.

Facts pertinent to this theory, photomicrographs, illustrative plates, review of literature, etc., will appear in a separate paper.

For their interest and many valuable suggestions I wish to thank Dr. Carey Culbertson, Associate Professor of Obstetrics and Gynecology, Rush Medical College, and Dr. George W. Bartelmez, Professor of Anatomy, University of Chicago.

(For discussion, see page 611.)

THE BACTERIOLOGY AND PATHOLOGY OF CHRONIC CERVICITIS*

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I. INTRODUCTION

THIS investigation of chronic cervicitis deals with the bacteriologic examination of organisms in the depths of the tissue and also with the histopathologic study of the sections.

It is accepted that chronic cervicitis is due to a persistent infection in the depths of the compound racemose glands, which is characterized pathologically by a periglandular round cell infiltration. The cervix is prone to infections because of its situation in the vagina and because it is lacerated during labor. The crypts and lacunae of the mucous membrane of the cervical canal afford a protection for the invading organisms and in this gonococci may lie dormant for long periods. Instrumentation, childbirth, postabortal infection, sex trauma, prolonged wearing of pessaries, repeated reinfection from a chronic prostatitis, retrodisplacements, and other conditions causing a pelvic congestion, are important contributory causes of chronic cervicitis. It may also occur following vulvovaginitis in children, or the exanthemata, especially scarlet fever and diphtheria. Septic sore throat, and the general debilitating diseases may contribute to it also. The cervix following the initial gonorrheal infection, or injury forms a favorable habitat for the secondary invaders.

Investigators are agreed to the various organisms that are found on the surface of the pathologic cervical canal, but no mention has been made of the bacterial flora in the depths of the glands. It has been shown by Pilot and Davis¹ that the hemolytic streptococci were recovered in 58 per cent of the throats of individuals with normal tonsils, while the nonhemolytic type was present in almost 100 per cent of the tonsils. From the crypts of the hyperplastic tonsils, the hemolytic streptococci were obtained in 98 per cent. It was conceivable that a similar condition should exist in the cervix which would account for the persistent inflammatory condition.

II. REVIEW OF LITERATURE

It is a well-established fact that the normal genital tract above the external os is germ free. Winter² placed the boundary between the germ free and germ containing portions of the genital tract at the internal os. But Menge,³ Walthard,⁴ and

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Read at a meeting of the Chicago Gynecological Society, May 15, 1931.
I wish to express my appreciation to Dr. F. H. Falls, Dr. L. Arnold, and Dr. N. M. Percy for their kind assistance.

Stroganoff⁵ have shown it to be lower down in the region of the external os. Menge³ estimates that the bacteriocidal properties of the cervix are extremely high. He proved this by the inoculation of the staphylococcus and streptococcus into the cervixes of 15 women. After a maximum of twelve hours the secretion of the cervix which is alkaline was sterile again.

Infection of the cervix frequently dates back to a vulvovaginitis in early infancy²⁵ according to Hess.

According to Menge⁶ in adult females 95 per cent of chronic gonorrheal infections are located within the cervix, and in about 80 per cent of the acute cases.

Polak²⁶ maintains that fully 85 per cent of all women, single or married, have infected cervixes.

Fulkerson⁸ reviewed 6,483 gynecologic records of Cornell University Medical School and found a diagnosis of cervicitis or endocervicitis in 2,150 cases, or 33.16 per cent. The preponderance of married women who had borne children, or had miscarried, was 80.1 per cent together with a small number of single women. Fulkerson's statement supports the conclusions that the traumatism of labor or abortion is the chief factor in producing the disease. Therefore gonorrheal infection is not as frequent an etiologic factor as usually supposed.

The incidence of cystic cervicitis at the Mayo Clinic⁹ according to Masson and Parson is less than usually reported, occurring in 2,368 cases, or 1.05 per cent of 226,900 women examined for all conditions. Two hundred and eighty-three microscopic examinations were made in 661 cases, and 66.8 per cent were cystic cervicitis, 24 per cent cystic cervicitis with erosion, in 9 per cent hypertrophic cystic cervicitis, and in 10 per cent, it was stated no malignancy was found. These investigators emphasize that cystic cervicitis is not a simple infection, inflammation, or erosion, but is a process in which these factors have persisted until the final stage of cystic formation resulted.

Curtis¹⁰ is convinced that the hypertrophic cervical glands are a most important factor in chronic leucorrhea. The bacterial flora is fairly uniform and especially anaerobic gram-negative bacilli are most numerous. At least four types of gram-negative diplococci were encountered. Most important of all are the gram-positive diplococci, these may be anaerobic or aerobic and are almost always found in these cases which are subject to recurrent symptoms of acute inflammation. He also found a similar flora, but more varied from the purulent leucorrheal discharge from the vagina. In fresh vaginal smears these cocci are practically always in the form of diplococci. On artificial media they form very long chains composed of oval or lancet-shaped cocci in diplo-arrangement. The cocci of the different strains are subject to much variation in length, and may assume extremely long bacillus shapes. They also occur in pairs, tetrads, or short chains. Curtis states that he has encountered these gram-positive aerobic and anaerobic cocci in 30 per cent of his patients with chronic purulent leucorrhea. Their presence increases the danger of infection following instrumental abortion greatly, and they are responsible for many idiopathic puerperal infections, especially if there has been a cervical laceration extending into the broad ligament.

Arnold and Brody¹¹ in a study of 262 stains of gram-positive cocci from the cervical canal isolated staphylococcus 70 times, the enterococcus 96 times, the nonhemolytic streptococci 84 times, and the hemolytic streptococci 12 times. The average limiting H ion concentration of the enterococcus was P_H 5.0, the variations were between P_H 4.7 and P_H 5.6, and were therefore within the human or pathogenic range. They found that the vaginal bacterial flora resemble in many respects certain fecal types; that the gram-positive cocci of the cervical canal differ from those found in the vagina. Also there is a gradual loss of power of the cervical enterococcus to ferment mannite, which is so typical of fecal strains, and they become more pathogenic for mice. They attribute both of these differences to the more

parasitic mode of existence of the organisms in the cervical canal under the conditions found in their cases.

Dible¹² examined 152 stains of fecal streptococci by utilizing Andrewes and Horder's¹³ sugar fermentation test (dropping neutral red as not reliable from his experience). Yules' coefficient, and Houston and McCloy's heat resistance test, through which he was able to divide them into four groups: (1) A mannite fermenting group. (2) A raffinose or inulin fermenting group. (3) A "combined" group comprising types which split mannite, as well as raffinose, or the polysaccharide inulin. (4) An undifferentiated group which lacks action on any of these substances.

His Group I corresponds to the central group of Andrewes and Horder's, but his other groups show the weakness of Andrewes and Horder's classification, as the variants are nonmannite fermenters, but heat resistant. Therefore they belong to the class of "enterococcus." This term he selects in preference to *Streptococcus fecalis* which he maintains is confusing in that all fecal streptococci are not *Streptococcus fecalis*. These strains tested for pathogenicity by injecting mice and rabbits gave apparent negative results.

Moench¹⁴ points out that chronic arthritis may follow chronic endocervicitis. Eighty-two miscellaneous cases with leucorrhea were studied bacteriologically, 38 strains of which were used for animal inoculation. Cultures were made from the cervical canal with sterile swabs. The organisms encountered were found to correspond closely with the classification of bacteria, isolated by Curtis from his studies on the vaginal and cervical flora encountered in chronic leucorrhea. The short chain anaerobic diplostreptococci in fluid medium assumed a large number of elements, and on subculture tended to lose their irregular staining and become aerobic. The aerobic streptococci encountered appeared as lanceolate diplococcus, with but slight tendency to grow in chain formation. These organisms were pathogenic for animals and showed marked affinity for joints.

From a case of progressing arthritis with absence of other foci of infection, Moench showed that the specificity of the organisms depended upon its virulence and environment. In 98 per cent of the rabbits inoculated with the anaerobic streptococci (obtained by dissecting away first the glandular cervical mucous membrane, and then macerating the cervical myometrium with the basal glands) the organism had a marked specificity for joints as against 54 per cent of a series inoculated with the aerobic strains obtained from the cervical mucous membrane of the same patient. From this experiment Moench regards the aerobic strains as modified forms of the more highly virulent and more definitely specific anaerobic streptococci, which are deeply embedded in the submucous muscular tissues of the infected cervix.

Sturmdorf¹⁵ maintains that the cervical lymphatics convey an infection throughout the muscular planes, as an ascending lymphangitis and invades the contiguous adnexa, thereby inhibiting their normal function. He characterizes the cervical mucosa as the uterine tonsil, as he considers chronic endocervicitis as primarily and essentially an infection of the deeply situated terminal tufts of the endocervical muciparous glands. Microscopically the sections reveal according to Sturmdorf a hyperplasia of the lymph vessels with surrounding round cells, and miliary abscesses in the musculature of the portio. There are also streaks of dense round cell infiltration peri-glandular, subepithelial and intermuscularly. The distention of the glands he maintains is due to the occlusion of the ducts and produces the Nabothian cysts. These may honeycomb the cervical structure or becoming purulent riddle it with miliary abscesses.

Matthews¹⁶ substantiates Sturmdorf's contentions. He further shows that sections from the excised cones beginning at the external os reveals marked inflammatory changes, but as the internal os is approached, these changes are barely present or are entirely absent. He calls attention to the efficiency of Sturmdorf's method insofar as the removal of the infected area is concerned.

Koster¹⁷ says tracheloplasty as advocated and practiced by Sturmdorf would seem to be the logical form of treatment. In undoubted cases of chronic endocervicitis by this technic, a piece of tissue was excised from the new cervical canal before relining with the mobilized vaginal cuff. This section microscopically showed glandular elements and surrounding inflammatory reaction, similar to the tissue removed in the cone-shaped wedge. Koster feels that the Sturmdorf operation does not remove the infected area entirely.

Kennedy¹⁸ states that Adami summing up Hohnfeldt's observation on the process occurring in a suppurative inflammation that ends in healing and encapsulation of the debris of leucocytes, and micrococci, did not state whether the micrococci remaining were dead or alive. Kennedy states that the reviewed literature up to 1921 did not answer this question, and it is doubtless due to the difficulty in demonstrating bacteria in round cell infiltration of such small volume. In a review of the literature to date I have been unable also to find any reference on demonstrating bacteria in chronic cervicitis. Kennedy further states where there is leucorrhea there must be an interstitial irritant, and this is most probably produced by the toxin from the bacteria in the foci of the round cell infiltration.

Harris¹⁹ reports in 223 cesarean sections performed in the obstetrical service of Johns Hopkins up to May 15, 1922, supracervical hysterectomy was performed sixty-four times. Of these forty were subjected to histologic study, and in twenty-three of them definite histologic evidence of ascending infection was found. This was characterized by leucocytic infiltration or actual inflammatory reaction in the mucosa of the cervix and lower uterine segment. In many specimens the presence of bacteria were demonstrated by suitable stains. According to Harris the bacteria were present in the supravaginal portion and most intense there. Therefore this investigator states it is safe to assume that in the presence of an ascending infection the entire cervix would certainly be involved (personal communication).

III. BACTERIOLOGIC AND PATHOLOGIC TECHNIC

The cervical tissue was enucleated by Sturmdorf's technic, using either the radio knife or the scalpel. The sterilized enucleated cervix was immediately placed in a small sterile glass jar with a cork stopper and were examined within one-half to two hours. The technic employed for the grinding of the tissue under aseptic conditions was that described by Maryan²⁰ in a previous communication. In the early part of the work, the outer surfaces of the tissue were sterilized by searing it through the flame before grinding, but thereafter the tissue was sterilized by holding the tissue into boiling water for 15 seconds. This was found easier and equally efficacious.

Media: The culture media used was dextrose infusion broth 2 per cent, bactodehydrated medium veal infusion of P_H 7.3, blood agar (human blood 10 per cent), plain agar and egg yolk agar plates. At times 20 per cent ascitic fluid was added to the veal infusion and to the blood agar plates. Throughout the work veal infusion was used mainly. Test tubes containing 10 c.c. of veal infusion for the inoculation from the surface, and small flasks containing 100 c.c. for the ground tissue were used. Cultured aerobically and anaerobically at 37.5° C., from twenty-four to forty-eight hours or longer. The pyrogallie acid potassium hydroxide method in a dessicator was used for anaerobiosis. The terminal hydrogen-ion concentration was determined between five or ten days incubation.

The sugar fermentation reactions of 1 per cent using Brom cresol purple as an indicator were tested by utilizing Gordon's,²¹ Andrewes and Horder's,²² Holman's,²³ and Dible's²⁴ sugar fermentation classification. The sediment was observed in 100 c.c. plain broth in a small flask. The pathogenicity was determined by injecting mice with $\frac{1}{4}$ c.c., $\frac{1}{2}$ c.c., and 1 c.c. of a twenty-four-hour veal infusion culture intraperitoneally.

IV. BACTERIOLOGIC RESULTS

Experiments: From 51 cases, 41 strains of gram-positive cocci or 80.4 per cent were isolated and in the remaining 10 cases, or 19.6 per cent, the cultures were sterile. These organisms are gram-positive and are facultative aerobes. Morphologically, Figs. 1 and 2, they occur predominately as lanceolate, or oval, diplococci surrounded by a halo and in short chains of three to four cocci, but also associated with tetrads and small clusters. They appear pleomorphic, Fig. 3. The cocci assume various



Fig. 1.—Strain 15 ($\times 2000$). *Enterococcus*. (1) Lanceolate diplococci with halo. (2) Short chain. (3) Tetrads. (4) Clusters.

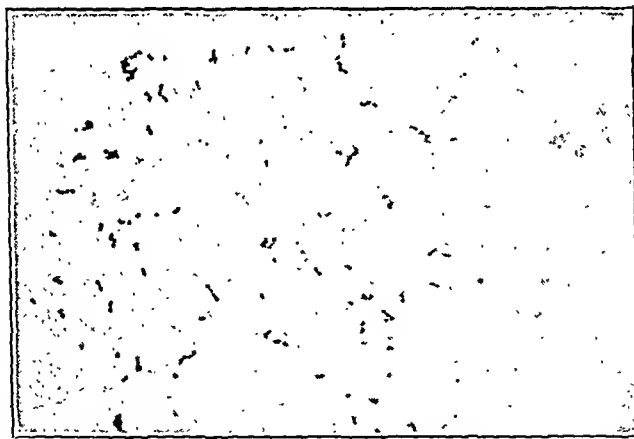


Fig. 2.—Strain 60 ($\times 1380$). Forty-eight-hour aerobic ground culture. *Streptococcus fecalis*.

forms, positions, and appear swollen. They have no capsule. The long chained cocci have also been isolated from nine strains (Fig. 4). Upon blood agar plates they appear as small moderately elevated pinpoint to pinhead moist grayish white colonies, which grow luxuriantly with no discoloration. Four strains showed large whitish colonies with definite hemolysis (probably hemolytic enterococcus, described by Weatherall and Dible.²² Upon plain agar they grew similarly with no difficulty. The colonies vary in size from 0.3 mm. to 0.7 mm. in diameter. Upon transilluminated light they appear oval, granular, semi-opaque, and surrounded by a narrow clear zone, just within the outside margin of the colony. The sediment in a test tube of veal infusion appears granular and in streaks radiating downward from the surface. The sediment in a small flask of 100 c.c. plain broth appears white, stringy

and mucoid. They are very resistant and can be kept alive without difficulty after several years in original culture. In our laboratory our cultures have been kept alive for six months at 37.5° C. They are saccharolytic. From our study of the carbohydrate fermentation, our strains can be classified only as indicated in Table I into a biologically active group, a biologically inactive group, and the variables. They are heat resistant with standing 60° C. for one-half hour. From five cases the filtrates were prepared according to the technic of Pilot and Afreuw²² to determine the presence of an exotoxin. The skin tests upon women who had chronic cervicitis,

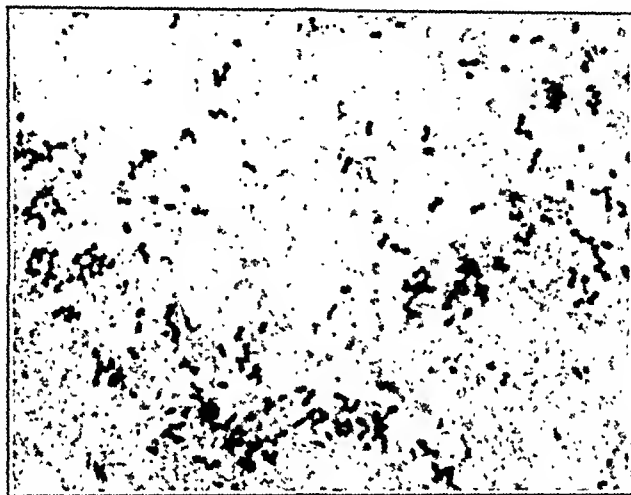


Fig. 3.—Strain 60 (x1380). Forty-eight hour anaerobic ground culture. *Streptococcus fecalis* with marked pleomorphism.

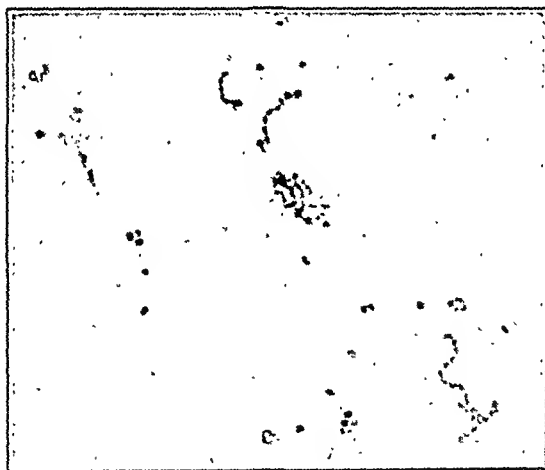


Fig. 4—Strain 55 (x1380). Long chain enterococcus.

mice injected intraperitoneally with $\frac{1}{2}$ - $\frac{1}{2}$ and 1 c.c. of twenty-four-hour cultures, and five rats injected intraperitoneally with 3 c.c. of the filtrate, were all negative. The terminal hydrogen concentration, after five days' incubation at 37.5° C. determined by the Hellige²³ method, ranged from P_H 4.3 to P_H 6.7.

Out of a series of 72 mice, 12 died, and the same organisms were recovered from the blood of the heart in all.

The organisms described correspond morphologically and biologically with the *Streptococcus fecalis* or enterococcus of Dible,²² or the enterococcus described by Arnold.²⁴ Therefore we call it the enterococcus (Table II).

TABLE I. SUGAR FERMENTATIONS

STRAINS	DEXTRROSE	LACTOSE	MALTOSE	LITMUS MILK COAGULATED	MANNITE	SALICIN	NITRATE	GLYCERIN	GELATIN	ARABINOSE	SACCHAROSE	RAFFINOSE	INULIN	DULOITE	
34	+	+	+	+	-	+	+	+	+	-	+	-	-	-	
42	+	+	+	+	+	+	-	+	+	-	+	-	-	-	
44	+	+	+	+	+	-	-	-	+	-	-	+	-	-	
41	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
47	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
39	+	+	+	+	-	-	+	+	-	-	+	-	-	-	Hemolytic
51	-	-	+	+	-	-	-	-	+	-	+	+	-	-	
57	+	-	+	+	+	-	+	-	+	-	+	+	-	-	
43	-	-	-	-	-	+	-	-	-	+	+	+	-	-	

TABLE II. DIFFERENTIAL TABLE OF GRAM-POSITIVE COCCI

	STAPHY- LOCOCCUS	STREPTOCOCCUS FECALIS	ENTEROCOCCUS	PNEUMO- COCCUS
Morphology	Clusters large and small	Diplococcus lan- ceolate and short chains	Diplococcus lanceo- late short chains tetrads and small clusters	Diplococcus lanceolate
Capsule	Negative	Negative	Negative	Positive
Mannite	Negative	Positive	Negative	Negative
Inulin	Negative	Negative	Negative	Positive
Bile Solubility	Negative	Negative	Negative	Positive
Heat Resistance	Negative	Positive 60° C. for 30 minutes	Positive 60° C. for 30 minutes	Negative
Mouse Pathogenicity	Negative	Slight	Slight	Very
Longevity	Negative	Very—months to several years	Very—months to several years	Short

V. INTRODUCTION TO PATHOLOGY OF CERVIX

There is considerable divergence of opinion regarding the fundamental pathology and histopathologic picture in chronic cervicitis. Some authors claim that only the mucosa is affected by the inflammation, while others believe that associated changes in the myometrium give evidence that more than the mucosa is involved in the process, and that this involvement has a real clinical significance.

From a review of the literature one gathers that chronic cervicitis is a persistent infection in the depths of the compound racemose glands with associated cellular infiltration and proliferation. The greatest involvement may be in the intracellular infiltration, glandular prolifera-

tion, exudation, edema and vascular engorgement. Again the involvement may also be a mild subepithelial, periglandular or scattered round cell infiltration with some glandular increase. The section appears almost normal. But usually chronic cervicitis is that of a progressive persistent infection with its diffuse periglandular round or plasma cell infiltration interstitially and perivascular. There is also marked glandular proliferation, vascular engorgement, dilated lymph spaces, with localized lymphoid tissue in the musculature, and a fibrosis of the musculature. Usually associated with these findings are the erosions in various phases.



Fig. 5.—Section 59 ($\times 95$). (1) Hypertrophy and hyperplasia of glands with scattered periglandular round cell infiltration. (a) Papillary projections into lumina. (2) Interstitial edema. (3) Extent of gland deep into stroma.

VI. PATHOLOGIC TECHNIC AND RESULTS

The object of this study was to determine the organisms in the depth of ground-up cervical tissue and to correlate these findings with the histopathologic changes in the depths of the glands of the endocervix; also whether or not organisms could be demonstrated in the tissues by suitable stains.

This report relates to 49 gynecologic patients complaining mainly of leucorrhea, and showing grossly definite evidence of chronic cervicitis. Thirty-nine of the sections were those in which the bacteriologic cultures were positive, and 10 of those in which the cultures were sterile. In some cases pelvic infection or retrodisplacements were also present. There were several nullipara, but the majority were multipara with concomitant lacerations and relaxations. A few of our cases had previous cauterizations and a few showed cicatricial obstruction of the cervical canal. Several cases gave a history of previous gonorrheal infection and several others were verified in our venereal clinic. From a few cases of procidentia the sections were obtained from the amputated cervical lips.

Paraffin sections were stained with hemotoxylin and eosin, and Van Gieson methods for general study. The Gram-Weigert, Levaditi (especially for spirochetes), Brown and Brenn,²⁴ and Wolbach-Giemsa stain for the demonstration of the bacteria.

Microscopic sections display the disturbed equilibrium between the endocervical glands and the subepithelial stroma. The histology in most instances displays the superficial stroma, rich in newly formed widely dilated capillaries with a moderate to intense round cell infiltration. The glands are hyperplastic and hypertrophic, Fig. 5, and many are dilated even to the point of forming cysts. Other sections show slight to moderate glandular proliferation with desquamation of the glandular epithelium. Usually some of the hypertrophic glands extend considerably into the fibromuscular tissue. The glandular epithelium usually shows papillary projections

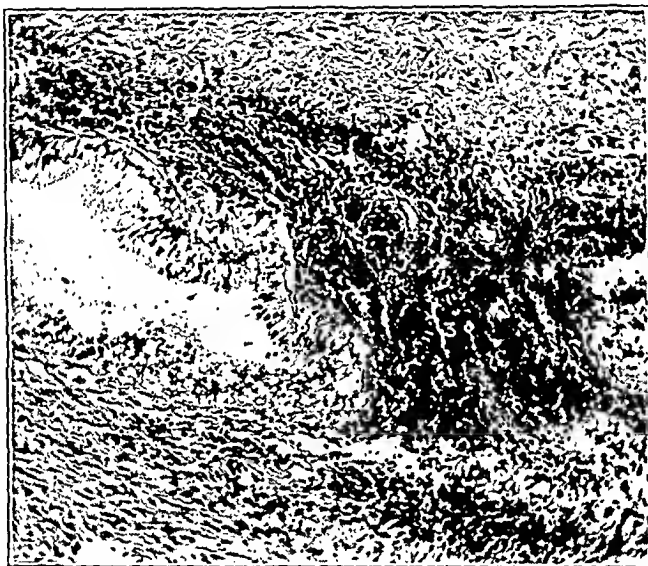


Fig. 6.—Section 43 ($\times 250$). (1) Hypertrophy of gland with stratification of glandular epithelium. (2) Vacuolization and displaced nuclei. (3) Characteristic periglandular round cell infiltration.

extending into the lumina. The glandular lumina usually contain granular or homogeneous pale unstained debris. The nuclei of the glandular cells (Fig. 6) may be displaced, distorted and show several layers or more of polygonal cells. The glandular epithelium may also appear stratified with scattered or absent nuclei. The periglandular stroma fibers are usually widely separated as a result of interstitial edema, and a periglandular round cell infiltration is commonly seen. This may be sparse or very dense and appear on one part of the gland as a focal area, or at times invading the basement membrane of the glands.

The deep stroma was frequently the seat of small to moderate perivascular round cell infiltration, Figs. 7 and 8, especially seen invading the perivascular lymph sheaths. Otherwise it usually displays fibrosis, hyalinization, or atrophy. Frequently focal areas of round cell infiltration were encountered.

In a number of sections coalesced cystic glands deep in the stroma associated with normal looking glands were seen, within other parts of the same section evidence of chronic inflammation, such as described above, was present. These are interpreted as recurrent types of chronic cervicitis.

Three of the sections showed an intense round cell infiltration invading the endocervix (Fig. 9) and musculature with marked desquamation of glandular epithelium. In these sections were seen mixed polymorphonuclear leucocytic and

round cell infiltrations, forming small abscesses in the stroma. The abscesses, Fig. 10, were usually situated in the subepithelial area. In one case they were encountered in the stroma of the papilla of the gland. These sections also showed hyperchromatic cells, plasma cells and eosinophiles.

In a number of the sections were found glandular and follicular erosions, associated with the above-described pathology. The sections that were enucleated by



Fig. 7.—Section 18 ($\times 220$). (1) Diffuse interstitial round cell infiltration of musculature. (2) Diffuse perivascular round cell infiltration.

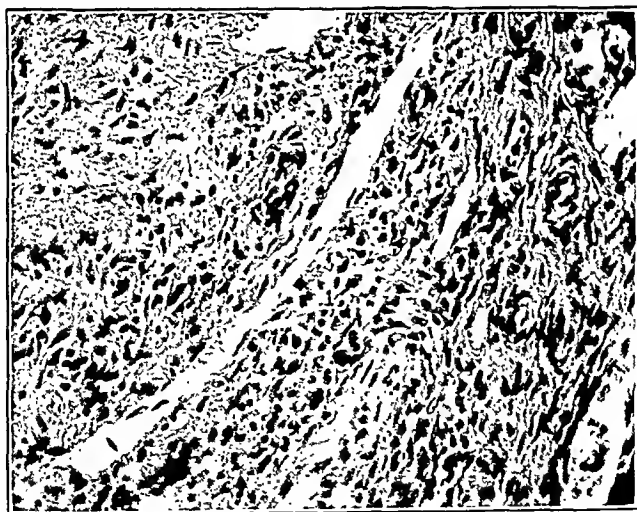


Fig. 8.—Section 2 ($\times 450$). (1) Perivascular round cell infiltration. (2) Round cell infiltration of perivascular lymph sheaths.

the radio knife showed, liquefaction necrosis. The sections in which the cultures were sterile gave similar pathologic findings. This can be accounted for by several factors, either the organisms were of such very low virulence that they could not be reactivated by culture, or else they may have been killed by the exudate or tissue products. It is also possible that these cases are those which may have occurred from mechanical or chemical irritation.

We were unable to demonstrate by staining methods bacteria in the tissues. It was thought possible that by our routine bacterial stains, Gram-Weigert, and Levaditi, there might have been a possibility of overlooking them. Therefore the Brown-Brenn differential stain, and the Wolbach-Giemsa stain were used as a means of a check upon the same sections in a large number of cases.

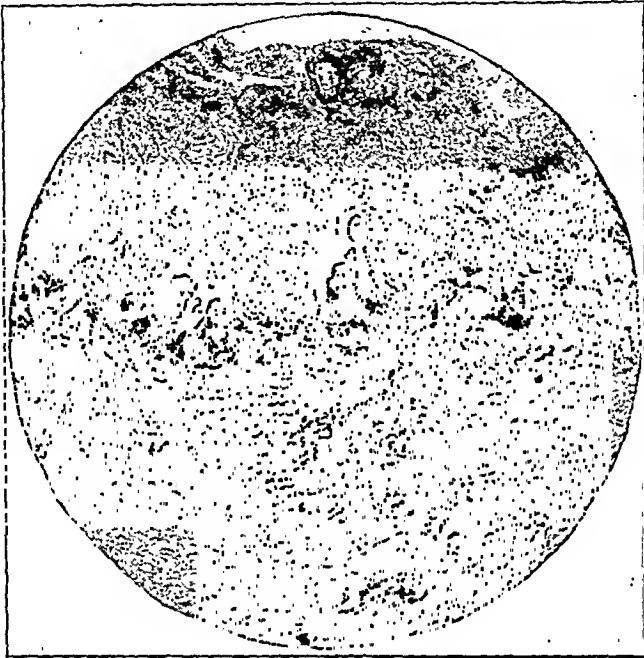


Fig. 9.—Section 42 ($\times 52$). Extensive round cell infiltration of endocervix. (1) Glandular desquamation. (2) Focal areas of necrosis. (3) Round cell infiltration of musculature.

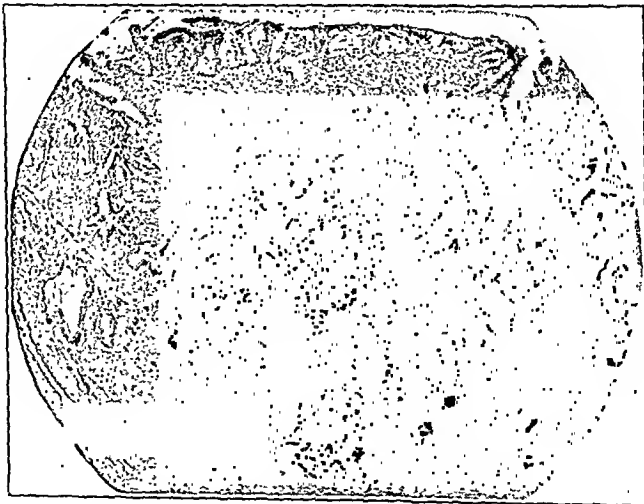


Fig. 10.—Section 37 ($\times 66$). Recurrent endocervitis. (1) Miliary abscess. (2) Focal area of round cells with focal area of necrosis. (3) Marked periglandular round cell infiltration of musculature. (4) Hypertrophy and hyperplasia of glands.

Our negative bacterial findings are in accord with the consensus of opinion of other investigators that it is extremely difficult to demonstrate bacteria in chronically inflamed tissues.

The correct term for chronic inflammatory invasion of the cervix is cervicitis. It designates pathologically that the deeper structures have been invaded by inflammatory infiltrations and glandular proliferations. This is borne out from the study of our sections.

VII. SUMMARY

1. The organisms isolated are the enterococcus.
2. Because of the methods employed we feel that the organisms isolated are from the depths of the compound racemose glands.
3. These organisms are highly heat resistant, of relative low virulence and tendency to live long.
4. In 80.4 per cent of cases the cultures were positive and in 19.6 per cent they were negative.
5. Paraffined sections stained with hemotoxylin, and eosin, and Van Gieson methods were done routinely for general study.
6. The bacterial stains used were: (1) Gram-Weigert, (2) Levaditi (mainly for spirochetes), (3) Wolbach-Giemsa, and (4) Brown and Brenn.
7. No bacteria in the tissues were demonstrated in our series of 49 cases of chronic cervicitis.
8. Microscopic sections reveal mild, moderate, recurrent, and intense cellular infiltration and glandular proliferation of the endocervix and the deeper structures.
9. Glandular and follicular erosions were also encountered in many of the sections.
10. Chronic cervicitis is preferable to the term chronic endocervitis, as the deeper structures are generally involved.

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SOME OBSERVATIONS ON THE ASCHHEIM-ZONDEK TEST IN THE DIAGNOSIS OF PREGNANCY*

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SINCE the hormonal test for the diagnosis of pregnancy was first suggested by Aschheim and Zondek in 1928, an extensive literature on this pregnancy test has emanated from all parts of the world. The earlier workers busied themselves with experiments corroborating its value, while many of the later authors have concerned themselves with changes and refinements to make it more applicable as a clinical aid in diagnosis. Our work has been confined to the latter.

The physiologic basis for the pregnancy test has been fully covered by the original authors in their numerous writings. A brief review will

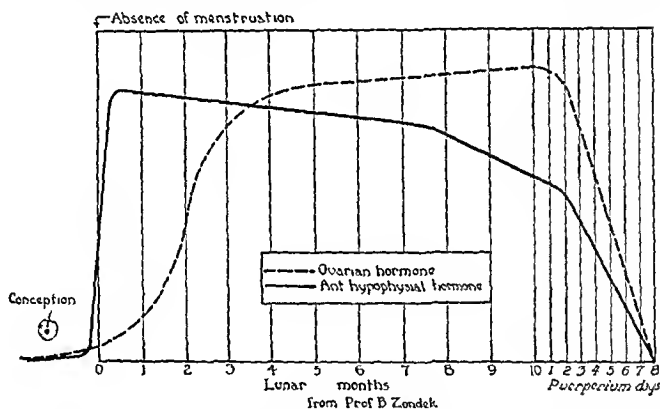


Fig. 1.—A graphic illustration of the concentration of ovarian and anterior hypophyseal sex hormone in urine of women during pregnancy and puerperium.

suffice here. The urine of pregnant women, after the third week, contains an abundance of sex hormone similar to that elaborated by the anterior pituitary gland (Fig. 1). This anterior pituitary sex hormone is nonspecific in that it stimulates either ovaries or testes, causing them to produce their own specific sex hormones. The testis or ovarian hormones stimulate the growth of the sexual organs and hasten sexual maturity. The injection of anterior pituitary hormone or urine from pregnant women in the immature female rat causes maturation of the follicles, massive hemorrhages resulting in the characteristic macroscopic blood points, numerous corpora lutea, and atretic follicles (Figs. 2 and 3). In the male, this nonspecific hormone from the urine produces changes in the secondaries, hypertrophy of the seminal vesicles, prostate, and vas deferens.

*Read at a meeting of the Chicago Gynecological Society, May 15, 1931.

Aschheim and Zondek make use of immature mice as test animals for the demonstration of the anterior pituitary hormone in the urine of pregnant women. Five mice, weighing from 6 to 8 grams, are each given six subcutaneous injections of pregnancy urine, varying from 0.2 to 0.4 c.c. per dose, over a period of forty-eight hours. The animals are

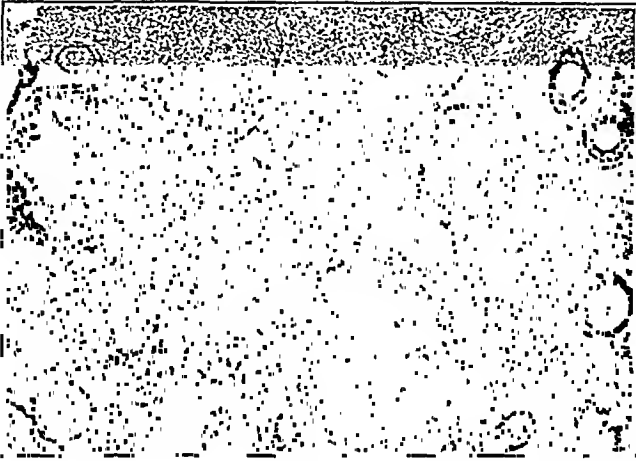


Fig. 2.—Microscopic section from the ovary of an injected rat showing extensive luteinization, but not as marked as in Fig. 3.

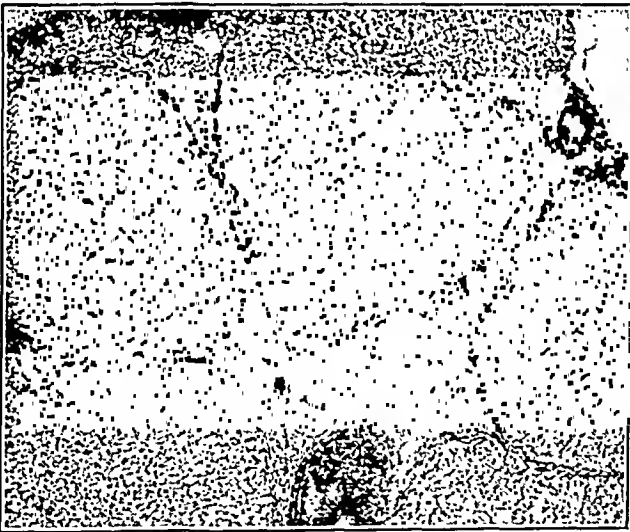


Fig. 3.—Microscopic section from a rat showing complete luteinization of the ovary, the result of injections with pregnancy urine (X 120).

killed at the end of ninety-six hours following the first injection, and the organs are examined macroscopically and microscopically.

Many observers have described modifications of the original method in order to simplify and make it more adaptable to routine clinical use. Friedman injects pregnancy urine in the ear-vein of rabbits, producing typical ovarian findings within from thirty-six to forty-eight hours,

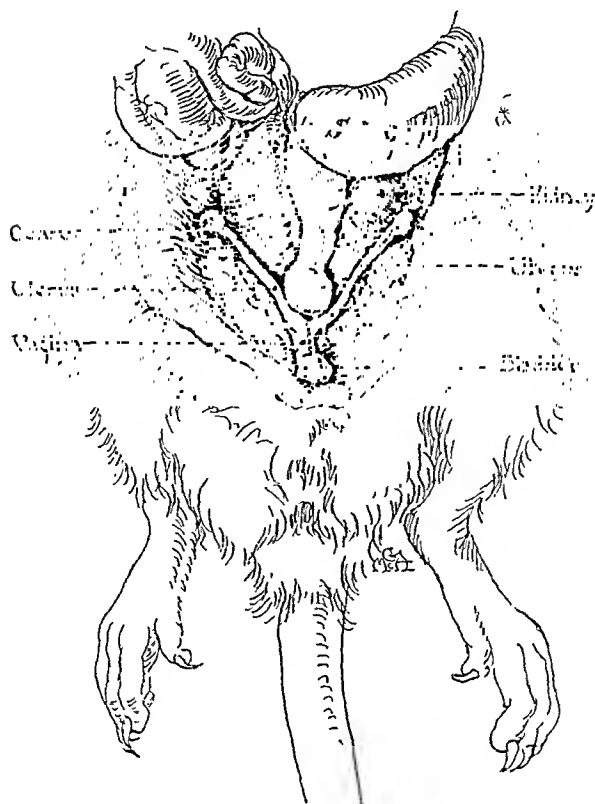


Fig. 4.—Control. Uninjected female rat. Normal genitalia in situ in the immature female rat.

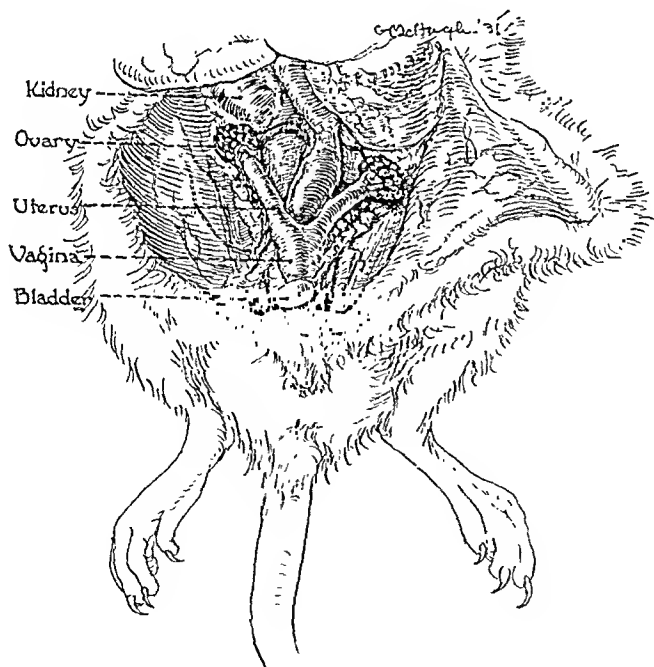


Fig. 5.—Injected female rat, litter mate. Positive reaction. Note the enlargement of the ovaries, the characteristic hemorrhages, as well as the maturity of the entire genitalia.

thereby shortening the test. Mathieu and McKenzie make use of female rats, injecting only one animal with 0.5 c.c. of urine twice daily for three days and examining the genitalia in ninety-six hours. Brouha first suggested the use of male mice, immature and mature. The pregnancy test here depends upon the maturation of the accessories through the stimulation of the gonads by the anterior pituitary hormone in the urine.

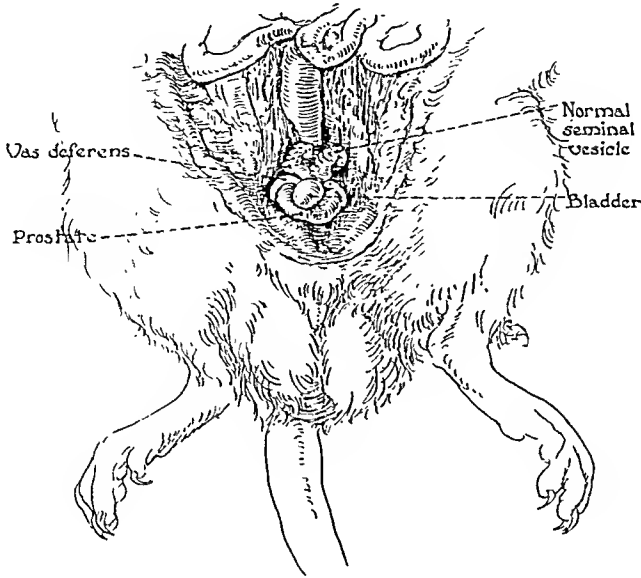


Fig. 6.—Control. Uninjected male rat. Normal male genitalia in situ in the immature male rat.

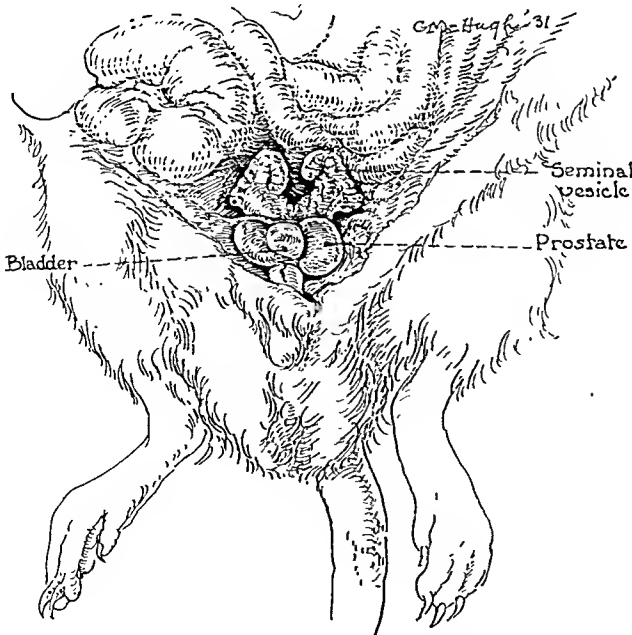


Fig. 7.—Injected male rat, litter mate. Positive reaction. Note the enlargement of the seminal vesicles and prostate.

AUTHORS' METHOD

Immature female rats can be weaned when they are about 20 days old. When they are from 25 to 30 days old and weigh from 30 to 35 grams, they are ideal for the pregnancy test. We prefer three rats which are litter mates, using two for the injection and keeping the largest for the control. The test rats are given two injections each of one cubic centimeter of urine daily for two days. All three rats are anesthetized ninety-six hours after the first injection and the genital organs are examined in situ and compared with those of the control.

The following changes may be noted in a positive test for pregnancy:

The ovaries of the injected rats are grossly enlarged, irregular in outline, and hyperemic. On the surface one can note small hemorrhagic areas—the blood points. The accessories are also enlarged and congested in comparison with those of the

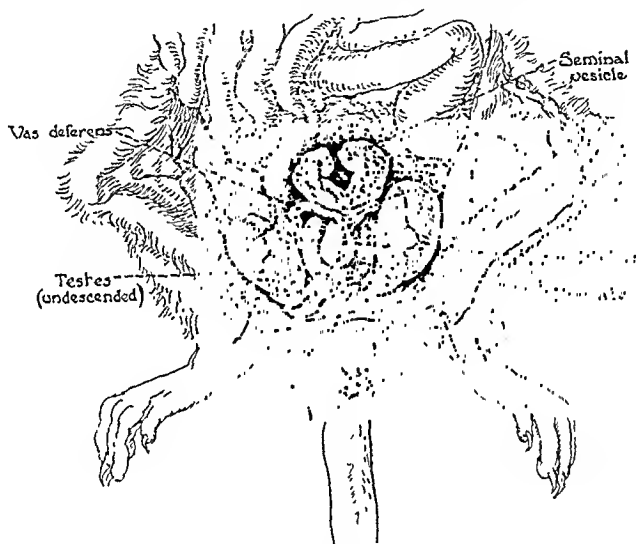


Fig. 8.—Injected male rat, a litter mate, with undescended testis. Positive reaction. Note the marked enlargement of the seminal vesicles, the vas deferens, and prostate.

control animal. Maturity of the entire genital tract is in evidence; however, only the findings of the ovary should be used to decide the pregnancy test (Figs. 4 and 5). On microscopic section the ovary contains numerous large follicles in all stages of maturation. Massive hemorrhages are present in many of the follicles. The marked tendency towards luteinization is evidenced by numerous corpora lutea, the extensive replacement of theca and granulosa cells of many follicles by lutein cells, and the imprisonment of the ova within them, forming atretic follicles.

Immature male rats from 35 to 40 days old and weighing from 40 to 50 grams have proved, in our experience, to be excellent animals for this test. The test depends entirely upon the development and maturity of the secondaries, principally the seminal vesicles and prostate. Due to the size of the test animal the gross examination of the genitalia in situ is sufficient to make the diagnosis. Furthermore, they can tolerate injections of 2 c.c. of urine twice and three times daily, so that five or six injections can be given over a 48-hour period. In our earlier work, when all injections were given subcutaneously, the test took seven or eight days for its completion, thereby not being entirely ideal. Although Aschheim and Zondek cautioned against accidentally entering the peritoneal cavity as being fatal to the animal, Dr. F. L. Adair suggested that we try this method. At present all our injections in males and females are given intraperitoneally. The males can be examined from forty-eight to seventy-two hours after the last injection.

While we have made microscopic sections of many of the male and female tests, this has never been necessary for a diagnosis.

In the male rat one depends entirely on the precocious development of the sexual accessories for a positive pregnancy test. The seminal vesicles are distended and filled with their secretions. The epididymis and Cowper's glands are only slightly hypertrophied. When the test is positive this change in the accessories is striking (Figs. 6, 7, and 8).

There may be some gross enlargement and hyperemia of the testis. On microscopic examination the cells of the seminal vesicles are all columnar in type and distended with secretion.

The patient is instructed to bring a morning specimen of urine in a clean bottle. Catheterized specimens are not necessary, but one must insist upon the first morning concentrated specimen. When not used, the urine can be kept at "ice-box" temperature and heated to body temperature before the injections. No preservative is necessary, but a drop or two of toluol will preserve it for a week or longer. A 2 c.c. Luer syringe with a sterile hypodermic needle may be used for the injections. The rat is held in the palm of the hand, the abdominal wall picked up between the thumb and forefinger, the needle pushed through into the peritoneal cavity, and the contents slowly injected.

Aschheim and Zondek report as high as a 17 per cent mortality with their immature mice. We have had a 3.5 per cent mortality with the use of rats, and their deaths were all due to toxic urines. Of the six specimens of urine which killed the rats, three were from patients with severe hyperemesis gravidarum and two from patients with pyelitis. One can readily understand the cause of the toxicity in these cases. Zondek recently described a method for detoxicating urine before injection, but we have as yet had no opportunity to try this.

TABLE I

GROUP I	GROUP II
Diagnosis confirmed by subsequent examination or findings	Diagnosis could not be confirmed
157*	15

*Since this paper was read we have completed a total of 400 accurately controlled pregnancy tests with this method, using male and female rats as described. The percentage of error has remained less than 2 per cent. This additional work has convinced us that the male rat is somewhat more preferable for the test than the female.

TABLE II. ANALYSIS OF TOTAL GROUP OF CASES

	REACTIONS		ERROR
	+	-	
Pregnancy104	115	2	1.7%
Abortions 10			
Ectopic Pregnancies 3			
Menstrual Irregularities 45	1	44	1.5%
(other than pregnancy)			
Menopause 2	0	2	
Fibroids 6	0	6	
Postpartum 10	10	0	
Other Conditions 3	0	3	

RESULTS

The large majority of our tests were performed for the purpose of diagnosis, and the accuracy of the result was confirmed by subsequent observation and examination of the patient or at operation. The following tabulations briefly summarize the cases studied and give the percentage of error (Tables I, II, and III).

TABLE III. PREGNANCIES

TO 6 WEEKS	6 TO 12 WEEKS	3 TO 10 MONTHS	ABORTIONS	ECTOPIC	L. M. P. NOT KNOWN	REACTIONS		ERROR
						+	—	
33	15	29	10	3	27	115	2	1.7%

The three cases in which the test was in error are briefly summarized:

1. A patient, age twenty-eight, missed her menstrual period for five or six days, and a pregnancy test on female rats proved to be negative. Three weeks later the test was repeated on male rats and it was positive.

2. A case of known pregnancy gave a negative reaction near term.

3. A patient, age fifty, with a history of irregular bleeding for three months, gave a positive reaction. Subsequent observation proved her to be in the menopause.

The positive test is probably dependent upon living chorionic tissue being in contact with the circulation. Thus it remains positive for seven or eight days postpartum, when it becomes negative (Table IV). Likewise, it will remain positive for the same length of time following fetal death early in pregnancy and near term. In two missed abortions the test proved positive early after the suspected death of the fetus and became negative as the patient was kept under observation; the uterus failed to grow. All of the abortions, threatened or incomplete, gave positive tests. The usefulness of this test to determine retained secundines in incomplete abortions is doubtful during the first week following the abortion. Three unruptured ectopic pregnancies gave positive tests very early in their course and all were removed unruptured at operation.

TABLE IV. POSTPARTUM CASES

Case Number	4th day	5th day	6th day	7th day	8th day	9th day
124	+	+	+	+	—	—
123	+	+	+	+	—	—
25	+	+	+	+	—	—
152	+	+	+	+	—	—
153	+	+	+	+	—	—
159	+	+	+	+	—	—
160	+	+	+	—	—	—
178	+	+	+	—	—	—
179	+	+	+	+	—	—
181	+	+	+	—	—	—

It is in such cases that the pregnancy test gives very useful additional information.

The menstrual irregularities accompanying the menopause and endocrine disturbances offer excellent cases for differential diagnosis. Many a patient can be relieved of her anxiety in four or five days instead of the usual four to six weeks' observation.

Tumors, adnexal or uterine, associated with or without a pregnancy, may offer unusual difficulty in diagnosis, and any laboratory aid is more than welcome.

We have had no cases of hydatidiform mole or chorionepithelioma. In these conditions the concentration of the hormone in the urine is so great that only a fraction of the usual dose is needed to give a positive test. Many of the observers have suggested that every mole should have frequent hormonal tests, and the return of a positive reaction should be regarded with suspicion of the development of a chorionepithelioma.

SUMMARY

1. The biologic pregnancy test of Aschheim and Zondek, based on the principle of demonstrating the sex hormone of the anterior lobe of the pituitary in pregnancy urine, is a valuable addition to our obstetrical diagnosis.

2. The pregnancy test is most accurate in the first two weeks following the missed menstrual period, when bimanual palpation and examination is far too uncertain. It can, therefore, be of great value in the differential diagnosis of pathologic conditions simulating very early pregnancy.

3. The use of immature male and female rats has made the test more applicable to routine laboratory use.

4. Gross examination of the genitalia is sufficient to make an accurate diagnosis in more than 98 per cent of the cases.

5. The intraperitoneal injection of large doses of pregnancy urine in the rats has shortened the time necessary for the test so that one can usually await its outcome, except in emergencies.

DIATHERMY IN THE TREATMENT OF GONOCOCCUS CERVICITIS AND URETHRITIS

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DEFINITELY favorable results in the treatment of gonococcus infections of the cervix and urethra by diathermy, as reported by Corbus and O'Connor,¹ Walther and Peacock,² and Cumberbatch and Robinson,³ stimulated us to test the method. Thirty-eight unselected patients were treated by this procedure, and the results obtained form the basis for this report.

TECHNIC

A Wappler diathermy machine was used, with a cervical thermophore as the active electrode in both cervix and urethra, while the passive electrode was placed alternately over the abdomen and the sacrum. The number of applications varied from one to eight, but averaged six in both the urethra and the cervix, while the duration of the treatments varied from ten minutes to one hour, with the majority of twenty minutes' duration or longer. In some instances, treatments were given on succeeding days, and in others only on alternate days. In a few, the applications were alternated between the urethra and the cervix, while again the cervical series was completed to be followed by the urethral treatments, or vice versa. During the course of the diathermy treatments, no other therapy was employed. Temperatures were recorded from the thermometer on the inside of the active electrode. An attempt was made to maintain a temperature of 115° F. for the duration of the treatment, but in many instances, especially in the urethra, such a temperature could not be tolerated.

Observations were confined to those patients in whom gonococci were demonstrable microscopically in the secretions, and the effect of treatment was evaluated by the presence or absence of the organisms in three consecutive weekly smears (one of which must have followed a menstrual period), as well as by changes in the clinical signs, such as the amount of discharge and the degree of irritation of the vaginal mucosa. Of the 38 patients treated, 20 showed gonococci in the cervix and 31 had organisms in the urethra.

RESULTS

The results of the diathermy treatments upon the microscopic and clinical pictures in these 38 cases are tabulated in Table I.

TABLE I. RESULTS OF DIATHERMY TREATMENTS

LOCATION OF INFECTION	TOTAL CASES	SMEARS AFTER DIATHERMY		CLINICAL SIGNS		
		NEGATIVE	POSITIVE	IMPROVED	UNIMPROVED	WORSE
Cervix	20	14(70%)	6(30%)	4	7	3
Urethra	31	14(45%)	17(55%)	2	4	0
				8	5	1
				0	16	1

It is evident that diathermy produced satisfactory clinical and laboratory results in roughly one-quarter of these cases; in 4 of the 20 with cervical infection (20 per cent), and in 8 of 31 with urethral infection (26 per cent).

Closer analysis revealed that neither the number of treatments, the duration of each seance, nor the temperature maintained in the treated area had any direct effect upon the result obtained.

TABLE II. THE EFFECT OF TEMPERATURE AND DURATION OF TREATMENTS UPON THE MICROSCOPIC AND CLINICAL RESULTS

SMEARS STILL POSITIVE AFTER DIATHERMY			
<i>Cervical Infection</i>			
	CLINICAL SIGNS		
	IMPROVED	UNIMPROVED	WORSE
Average temperature	115.5	114.5
Average duration (minutes)	57	45
<i>Urethral Infection</i>			
Average temperature	108	106
Average duration (minutes)	27	60
SMEARS NEGATIVE AFTER DIATHERMY			
<i>Cervical Infection</i>			
	CLINICAL SIGNS		
	IMPROVED	UNIMPROVED	WORSE
Average temperature	113.5	113.5	112.5
Average duration (minutes)	52	29	27
<i>Urethral Infection</i>			
Average temperature	107.5	108	106
Average duration (minutes)	31	27	40

The 4 patients who had cervical gonorrhea and who apparently were cured by diathermy had treatments averaging fifty-two minutes at 113.5° F., while the successful urethral cases were treated for an average of thirty-one minutes at a temperature of 107.5° F.

The milliamperage employed has not been mentioned in the discussion, as Bordier⁴ has called attention to the fact that the flow of current is not an accurate index of the temperature, and our findings support this contention.

TABLE III. DISSEMINATION OF HEAT THROUGH PELVIC ORGANS

POSITION OF THE PASSIVE ELECTRODE	ACTIVE ELECTRODE IN THE CERVIX (DEGREES, FAHRENHEIT)		
	CERVIX	URETHRA	RECTUM
Abdomen	115	103.5	101
Sacrum	115	102	103
	ACTIVE ELECTRODE IN THE URETHRA		
	URETHRA	CERVIX	RECTUM
Abdomen	108	101	100
Sacrum	108	101	102

TEMPERATURES IN NEIGHBORING STRUCTURES

Observations on the temperature developed in surrounding structures were made in a number of patients and revealed marked variations, apparently no constant relationship being maintained between simultaneously taken temperatures in the urethra, cervix and rectum. Table III presents average readings and serves to give some idea of the dissemination of heat throughout the pelvis.

REACTIONS

Of the various reactions, which occurred during the course of the treatments, lower abdominal pain and cramps were the most frequent, being noted in seventeen instances. Cervical treatments precipitated uterine bleeding in seven patients, one of whom, a girl of twenty years, had her second catamenia since puberty following diathermy to the cervix. Discomfort in the urethra was a rather constant accompaniment of the urethral treatments, while in six cases severe pain in the urethra occurred even at the lower temperatures, and in four patients there was a constant desire to void, associated with some incontinence. Severe backache occurred in five individuals, nausea in four, and excessive pain in the vagina in one. Small necrotic areas appeared around the urethral orifice in two instances, and around the cervical os once. These lesions healed quickly after the diathermy was discontinued. There were no serious complications, such as acute salpingitis or pelvic peritonitis.

DURATION OF HOSPITALIZATION

All patients were confined to the hospital. The arbitrary criteria for dismissal as noninfectious demand three consecutive weekly negative smears, one of which must be taken after a menstrual period, together with disappearance of clinical signs of infection. Those patients whose secretions still contained gonococci, or in whom redness and discharge were still present after completion of the course of diathermy, were treated further by the usual procedures, antiseptics, douches, and cautery, until the criteria for noninfectiousness were satisfied. Since duration of hospitalization is of economic importance, we were interested to learn whether by the use of diathermy, we had shortened the hospital stay. These figures are shown in Table IV together with the findings in fifty similar patients treated by methods other than diathermy.

TABLE IV. DURATION OF HOSPITALIZATION

38 patients treated with diathermy	78 days (11 weeks)
50 patients treated by other procedures	56 days (8 weeks)

The shortest stay in the first group was twenty-eight days, which, incidentally, is the shortest possible under our standards for dismissal, while the longest was 216 days (31 weeks), in an extremely resistant case of urethritis. It is apparent that diathermy did not shorten the period of hospitalization, but, on the contrary, seemed to lengthen it by three weeks, which is roughly the time utilized by the treatments.

DISCUSSION

Van Leeuwen⁵ has called attention to the variations in temperature at which different workers have observed survival of the gonococcus, and it is even more uncertain at what temperature the organisms are killed in the presence of living tissue cells, as, for example, in the depths of the cervical glands. Provided the gonococci are killed quickly at a temperature of 113° F., and that it is possible safely to maintain a temperature of from 115 to 117° for considerable periods without destroying tissue cells, diathermy should be an ideal method of treating gonococcal infections of the cervix and urethra. Under such conditions, a single application above 113° F. should suffice to cure the patient. Our experience would indicate that the heat of diathermy does not penetrate to the organisms in the depths of the cervix and urethra in sufficient intensity to kill the gonococcus (the temperatures recorded are for the inner surfaces of the electrodes), or that these organisms in living tissues are not killed by heat as quickly as in the test tube.

Our results seem to have been better when moderate temperatures were employed, suggesting that the benefit noted in certain cases may have been due to an increased local vascularity (uterine bleeding was recorded in 35 per cent of the cervical cases), rather than to actual thermal destruction of the gonococci.

SUMMARY

Satisfactory clinical and laboratory results were obtained in 20 per cent of the series of patients with gonococcus cervicitis and in 26 per cent of those with gonorrheal urethritis by diathermy treatments alone. No serious complications followed the applications. The average hospital stay of the group was three weeks longer than that of a similar group of patients treated by other procedures.

Diathermy to the cervix and urethra may be looked upon as an adjuvant in the treatment of gonococcus infections of these structures, but not as a positive cure even when temperatures of 115 to 116° F. may be maintained. We believe that equally good results may be obtained by the simpler methods of treatment more commonly employed, and are inclined to the opinion that when diathermy gives good results they are due to the increased vascularity induced rather than to actual thermal destruction of the gonococci.

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TUBERCULOUS ENDOMETRITIS. REPORT OF CASES

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TUBERCULOSIS of the uterine body, commonly held to occur infrequently, is of frequent occurrence. Norris holds that with the exception of the tubes, the endometrium is the most frequently involved, in genital tuberculosis. The percentage of tuberculous salpingitis, varies from 5.5 per cent to 24.6 per cent of all salpingitis, according to various authors. In a series of 22 cases of salpingitis which came to operation during the last year, two, which we are presenting, were tuberculous and each was accompanied by tuberculous endometritis.

Clifford White finds the tubes involved in 85 per cent of all genital tuberculosis, the uterus involved in 53 per cent of all cases of genital tuberculosis, and the uterine body including the endometrium involved in 85 per cent of all uterine tuberculosis.

Though primary endometrial tuberculosis is said to occur, Norris found not a single instance of endometrial tuberculosis without an accompanying tuberculous salpingitis.

Neither of our two patients were suspected of being tuberculous, the first was operated upon for a fibromyoma uteri and the second was thought to have a chronic nonspecific salpingitis.

CASE REPORTS

Mrs. A. S., aged forty, was admitted May 12, 1930, complaining of abdominal pain. Menses began at eleven, every thirty days and of five days' duration with no dysmenorrhea. Her last period occurred on April 27, 1930. She has been married for twenty-eight years, but was never pregnant.

She complained of "dry pleurisy" of her right chest sixteen years ago lasting five weeks. At about the same time she was operated upon for rectal fissures.

About eight years ago she began to complain of burning pain in the left side of the abdomen, lasting off and on for a few years, treated by medications and finally disappearing. For two months prior to admission she complained of pain in her right lower quadrant, associated at one time with backaches. She also complains of a drawing pain in both inguinal regions.

On physical examination, there was an irregular nodular mass suprapubically. Her vaginal outlet was nulliparous. The cervix was held high behind the symphysis. The uterus corresponded in size to that of three months' gestation. The adnexa were not palpated. Her urinary and blood pictures were negative. A chest plate revealed no pleural changes. A preoperative diagnosis of "fibromyoma uteri" was made.

A laparotomy was performed the day after admission. The uterus was found enlarged and nodular. Some of the nodules were intraligamentous. The right adnexa were adherent to the upper portion of the sigmoid. The adhesions were separated, and a supracervical hysterectomy and left salpingo-oophorectomy were performed. Her postoperative course was uneventful. She was discharged in excellent condition on May 28, 1930, thirteen days postoperatively. Her physical condition has remained good following her discharge.

Grossly the uterus was twice its normal size and nodular, one nodule hanging freely in the uterus cavity by a narrow short pedicle.

The left tube was normal in size and patent. The fimbriated end was adherent to the ovary. Several small dewdrop cysts were present on the posterior tubal surface. The rest of the serosa was smooth. The mucosa was rough, shaggy, felt gritty and presented numerous white pinpoint projections above this surface.

The left ovary was cystic, and slightly larger than normal. On section many atretic follicular cysts and a corpus luteum were present.

Microscopically: 1. Uterus: The endometrial lining and glands were normal. Nests of normal glands were present deep in the wall. In the fundal portion of the endometrium many of the glands were lying parallel to the surface and somewhat atrophic. In this region a large tubercle was present. Separated from this tubercle by several uterine glands was a smaller similar tubercle.

2. Fimbriated end of tube: The plicae were swollen, fused. Adjoining the capillaries, in the fused plicae, was a group of numerous tubercles, surrounded by a heavy small round cell mantle. In the vicinity of the tubercles and in all the plicae were numerous giant cells, some engulfing calcified laminated particles. Some of these were in the center of one of the tubercles described above. The plicae themselves were heavily infiltrated with small round cells. The wall of the tube was not involved in any of the above described pathology.

3. Cystic portion of ovary and attached tube: The greater portion was cellular connective tissue and contained several "corpora albicantia." Areas of vessel congestion with polymorphonuclear infiltration were present at the periphery. At the lower pole of the section was a corpus luteum. Several atretic follicles were present in the center of the section surrounded by a small round cell infiltration. At the upper pole were many calcified areas.

The pathologic diagnosis was tuberculous salpingitis, both recent miliary and chronic miliary (healed, calcified), tuberculous endometritis, adenomyoma uteri, and multiple fibroids.

Case 2.—Mrs. M. Y. was admitted Nov. 15, 1929, complaining of pain in her left lower quadrant. Her menses began at thirteen, every thirty days for three days without dysmenorrhea. Her last menstrual period was Nov. 3, 1930. She was married seventeen years, grava v, para iv.

Her third delivery, ten years ago was followed by puerperal sepsis, leaving her with monthly recurring attacks of pain in the left lower quadrant. The pain was sticking and localized. Nine months ago she developed pain in the right upper quadrant, the pain radiating to the back and right shoulder and associated with jaundice and epigastric distress. Five days before admission she was seized with this pain, ran a temperature of 101°, and had chills the following day. On admission her temperature was still 101°.

Abdominal tenderness was present in both lower quadrants, with a sense of resistance over the left lower abdomen. Under anesthesia a definite mass was palpated a little above the left Poupart ligament, quite indurated. In the left fornix was a mass running obliquely from the left cornus of the uterus, about 10 cm. long, and about 6 cm. wide. There seemed to be a cleft between the mass and the fundus of the uterus. The mass was firmly fixed and did not move with the uterus. The right fornix was empty. She had 12,400 W.B.C. and 84 per cent polymorphonuclears and a twenty-five minute sedimentation time. A diagnosis of chronic adnexitis was made. A chest plate was negative for signs of tuberculous infection.

On Nov. 23, 1930, a laparotomy was performed. Marked adhesions of the bowels and omentum to the parietal peritoneum and to the left tube and uterus were present. The left tube was chronically inflamed and the ovary was cystic. The right tube was grossly normal and the right ovary somewhat cystic. The

peritoneum appeared chronically inflamed. The adhesions were carefully separated, but some pus was spilled into the peritoneal cavity. (Culture of this pus was sterile.) The left tube and ovary were excoised and the culdesae and left lower quadrant drained. The drains were removed on the fifth day postoperatively. The wound healed nicely. She was discharged as cured on Dec. 18, 1930.

The tube measured 5 by 3 by 2 cm., the serosa irregular but glistening and contained an irregularly small opening which led into a blind cavity in the tube, 1 cm. deep, the walls of which were ragged, but glistening and varied from grayish yellow to deep red. The wall of the tube was 3 mm. thick. Small cysts containing clear fluid were present in the upper and lower tube wall. The tubal mucosa was pink and velvety.

Very intimately attached to the tube was the ovary slightly larger than normal, and cystic throughout. On cut section, several corpora hemorrhagica, and several retention cysts were present.

The tubal mucosa was completely replaced by a very dense small round cellular stroma in which were found numerous tubercles. A few discrete giant cells and areas of endothelial cells without giant cells were also present.

Sections through the distal end of the tube showed large masses of polynuclear leucocytes and nuclear fragments on the mucosal surface.

Sections through the ovary revealed a few large retention cysts. The pathologic diagnosis was tuberculous salpingitis with secondary infection and abscess formation, and retention cysts of ovary.

After her discharge, the patient underwent the usual systemic treatment for tuberculosis. Her wound would open, discharge watery pus and then close in a few days. About a month before her second admission she complained of severe pain in her left lower quadrant, the lower angle of the wound was opened with the evacuation of about six ounces of thick greenish yellow pus, sinus opening remaining patent. Her physical condition was excellent, she had not lost weight nor had any symptoms of a systemic infection.

She was readmitted on Sept. 16, 1930. The old scar, including the sinus opening, was excised down to the peritoneum. An egg-sized mass beneath the peritoneum proved to be the left cornua of the uterus, the stump of the left tube and adherent small bowel. A probe passed through the fistulous opening in the peritoneum, led down for $\frac{1}{2}$ inch into the bowel. The bowel was separated and the fistulous opening into it closed. The right tube and ovary were buried in a mass of caseous adhesions. A supracervical hysterectomy and a right salpingo-oophorectomy were performed. She was discharged on Oct. 13, 1930 to a convalescent home, in excellent physical condition with a small discharging sinus.

Grossly, the mass of skin and fat was perforated by fistulas whose surface was lined by a glistening pinkish layer containing some scattered small dewdrop-like nodules on its surface.

The uterus appeared normal. The right tube was adherent to the right ovary by caseous adhesions.

Sections of the sinus were composed of cellular fibrous tissue in which were scattered several large tubercles with caseating centers. Degenerated striated muscle bundles adjoined the tubercles. A perivascular small round cell infiltration was present around the smaller vessels.

The endometrium contained numerous glands in the resting stage, a few parallel to the surface and atrophic. In the deeper portion of the endometrium among the glands, were a group of discrete small tubercles with caseating centers and circumferential grouping of small round cells. The stromal cells surrounding these tubercles appeared hyperplastic: a few resembled fibroblasts.

Section of the ovary showed cellular connective tissues containing corpora albicantia. Toward one pole of the section were several areas of homogeneous eosinophilic debris bordered toward one side by small round cells and plasma cells.

The pathologic diagnosis was tuberculous sinus, tuberculous peritonitis, tuberculous endometritis and tuberculous salpingitis.

In retrospect, both cases gave symptoms suggestive of tuberculosis, a story of years of abdominal pain, suggesting a low-grade peritonitis which in the absence of gonorrheal history or symptoms, should have been regarded as tuberculous. The first patient in addition had a definite history of dry pleurisy and rectal fissures.

The tuberculous endometritis in each case was early and the tubercles were present only in fundal mucosa surrounding the tubal mouths. This is suggestive of the view held by Norris that the spread from the tubes to the endometrium is by direct continuity through the opening of the tube into the uterus.

Because of early uterine involvement, a complete hysterectomy is advisable as soon as the diagnosis of tuberculous salpingitis is made to avoid a stormy postoperative course. This is brought out by the treatment and subsequent story of our two cases. The first patient was hysterectomized and made an uneventful recovery, without any future complication. The second patient presented bowel involvement and sinus formation after her first operation, and still has a discharging sinus two months after her second operation.

ENDOMETROID HETEROTOPIAS OF THE UMBILICUS

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A COMPREHENSIVE understanding of the embryology and histogenesis of the entoderm and mesoderm, in the embryo, is necessary in order to evaluate and classify the various types of cysts and heterotopias which may occur in the anterior abdominal wall. Especially is this necessary to clarify the possible source of the so-called endometriomas of the umbilicus.

The umbilical cord contains besides its arteries and veins, the allantois and yolk stalk. Normally the yolk stalk, which is in direct tubular connection with the gut track and lined by entoderm, atrophies at the sixth week; but any portion of it may persist, either within the abdominal cavity or in its passage through the abdominal wall. Roques⁴⁷ points out that portions of the vitelline duct may persist at the umbilicus, but the epithelium does not possess the function of menstruation, nor are these portions surrounded by endometrial stroma, and any portion of this tract may show heterotopic differentiation.

The allantois in the human embryo is only rudimentary and has no excretory function as in the lower scale of vertebrates; but does push out into the umbilical cord and remain patent until the second month when it normally becomes obliterated not simultaneously throughout its length but at irregular intervals so that small areas remain in which the lumen still persists. These areas may disappear later or give rise to cavities which later may form cysts. The lining of the urachal tube is composed of one or more layers of transitional epithelium which is covered by a circular and longitudinal coat of nonstriped muscle which in turn is surrounded by connective tissue. Cysts so formed often connect with the bladder and contain urine, their most frequent complication being intracystic hemorrhage. In practically all

cases cysts formed from the urachal stalk are lined by stratified epithelium and have a definite remnant of the stalk attachment to the bladder and thus are differentiated from the other cysts arising in the anterior abdominal wall.

Keibel, Lewis and Thyng describe diverticuli occurring normally in the entoderm tract of the embryo; and these because of some abnormal stimuli, according to Nicholson,^{41, 42} may form permanent diverticuli or cysts occupying any part of the gut or its periphery. The lining of these cysts may be stratified, cuboidal, columnar, flat, or any other variation. This is accounted for by Evans¹² as being due either to intracystic pressure, inflammatory changes, or error in differentiation of the lining cell. According to Begg,¹ there can be no doubt that cysts whose wall reproduces completely or incompletely the structure of the gut, whether discovered in the gut, attached to the gut, or remote from the gut, must have been derived from the gut. Meckel called only those diverticuli true diverticuli which were composed of all the walls of the entoderm canal and said they all arose from vitellointestinal duct anomalies; but since then cases have been recorded having a Meckel's diverticulum and also other diverticuli and heterotopias.

Nicholson^{43, 42} says heterotopias are due to anomalies of cell differentiation due to environment of the cells; if this is normal, differentiation is normal; if the cell is exposed to abnormal influences, its differentiation will be abnormal.

Gastric gland heterotopias at the umbilicus generally take the form of a polyp with or without a central sinus; resulting from heterotopic differentiation of an unobliterated vitelline duct. Taylor⁵³ says it is this type of heterotopia over which discussion of adenoma character is raised. These were first called intestinal heterotopias by Tillmanns⁵⁴ in 1882, and Muller⁴² in 1921 discussed them at length. Stone⁵² in 1923 reported thirty-eight cases from the literature, four of which came from gastric mucosa and the remainder from normal intestinal epithelium. Typical umbilical polypi of intestinal origin secrete intestinal juices and tend to reproduce the tissue of their origin.

The other structures of importance in the embryo as to possible sources of the so-called endometriomas of the abdominal wall are the mesoderm segments from which are derived the urogenital system and the peritoneum. Von Recklinghausen⁵⁶ in 1895 advanced the theory of the origin of endometriomas from remnants of the wolffian ducts. Ivanoff⁵² in 1898 believed its origin to be from a metaplasia of the peritoneal mesothelium, which view has been recently revived by R. Meyer^{2, 3, 39, 40, 57} and Lauche.⁵⁵ Walz⁵¹ describes the coelomic basal cell as bi-potent, that is, it is capable of forming two types of cells, serous epithelial cells and endometrial cells which are unipotent and differentiated. These two types of cells have a common origin, but develop along two divergent lines of differentiation according to the principles of physiologic specialization and adaptation to environment and function. It is in the highest degree unlikely that a serosal cell could by metaplasia become converted into an endometrial cell and explain the occurrence of uterine gland cells in the peritoneum. The only logical explanation is that such endometrial cells have arisen from basal coelomic epithelial cells, occurring scattered in the serous epithelium, which have remained during post-fetal life at the primitive stage and possessing the primary function of reproduction. Krompecher³³ has insisted that the reproductive capacity in any type of epithelium is greatest in the basal layer as it corresponds most nearly to the embryonic cell with its capacity for proliferation.

Cullen² in 1916 advanced his theory of embryonic inclusions of Mullerian duct tissue and to Cullen probably belongs the credit for first really studying adenomyomas of the umbilicus although Goddard has reported two cases a few years earlier. Halban^{45, 38, 37} in 1924 considered that the endometrial particles entered the lymphatics of the uterus and were thus carried to various situations. R. Meyer⁴⁰ criticizes this view in that endometrial cells have never been found in the lymphatics, and also

that a general endometriosis would be expected in a case of internal endometriosis. Mestitz³³ on the other hand, states that endometrial glands have frequently been found lying deeply within the myometrium, close to the lymph spaces which they have invaginated; also endometrial inclusions have been found in the regional lymph glands, although never found inside the lymph vessels. Recently Sampson^{48, 49, 50} has suggested still another view of implantation endometriosis in which implantations arise from fragments of endometrial tissue which have escaped into the peritoneal cavity during the menstrual period due to a back flow through the fallopian tubes and from the tubes themselves, and from endometrial growths upon the surrounding peritoneum. Extraperitoneal endometrial tissue arises from metastasis, from the mucosa of the uterus or from endometrioma of the peritoneum, by way of the venous or lymph circulation and from heterotopic endometrial tissue in the groin, vulva, umbilicus, and possibly in the vagina and pelvis. Cullen⁵⁶ more recently has stated that adenomyomas must be looked upon as embryonic inclusions especially when occurring in the round ligament and umbilicus: but some ovarian, some rectovaginal septum growths, some intestinal adenomyomas may owe their origin to transplanted uterine tissue; while adenomyomas developing in abdominal scars, after operations on the uterus or tubes are undoubtedly due to transplants and not to embryonic inclusions.

Jacobson²³ in 1922 was probably one of the first to attempt implantation, of uterine mucosa, in animals, endeavoring to prove or disprove the theory of Sampson. At this time autotransplantations of endometrial tissue were made into rabbits with the production of cystadenoma-like growths similar to cystadenoma of the ovaries. In later experiments, Jacobson^{24, 25} reinforced these findings by further intraperitoneal autotransplantations of endometrial tissue in rabbits and monkeys. In these studies he came to the conclusions that transplantations nearly always occurred on the pelvic peritoneum and not on the abdominal wall or mesentery. Castration at the time of transplantation did not prevent growth but the cysts formed were smaller and thinner walled.

Heim²¹ in a series of experiments on apes, divided them into three groups; in the first group, implants were made into the peritoneum of pieces of the animal's own decidua menstrualis; in the second, a fistulous opening was made between the uterus and peritoneal cavity during menstruation; in the third group, fresh human menstrual fragments were implanted into the peritoneum and ovarian epithelium, with simultaneous injection of human ovarian extract. These animals were all killed from forty to sixty days following these experiments and no growths were obtained; only inflammatory foci remained as evidences of the implantations.

Dossena⁷ in a series of experiments, on white rabbits and mice, removed the uterine mucosa, minced it and scattered it in the abdominal cavity, obtaining cystic growths of this tissue without scarification of the peritoneum. These cystic cavities were lined with columnar epithelium and were surrounded by a vascular connective tissue stroma and nonstriated muscle fibers; this evidence he believed to give support to the theory of Sampson. Katz and Szenes³⁰ transplanted pieces of endometrium into the peritoneal cavity of rabbits in some before and in some after castration. The transplanted tissue grew in those not castrated but did not grow in the castrated animals. From this they concluded that endometrial implants were possible but required ovarian hormone substance for their growth. Walz²⁷ and Heim,²⁹ on the other hand, say it is only the basal cells of the uterine glands which are productive of new cells and the cells shed during menstruation do not include these basal cells of the gland and therefore cannot grow and multiply. From this work with in vivo experiments it would seem that uterine tissue containing the basal layers of the glands will grow and multiply with implantation in the presence of ovarian hormone, but menstrual blood which does not contain the basal layer of the glands will not grow and multiply.

This class of tumors occurs only in women usually between the ages of 35 and 45;

they are small, reaching their full size within a course of a few months. At the menstrual periods, the tumor swells, sometimes becomes painful and may discharge a brownish bloody material. They are often governed by the same laws as uterine mucosa in its reaction to menstruation, pregnancy and the menopause. The overlying skin is usually intact, and often pigmented in those of the umbilicus, and lying just beneath the skin are one or more brownish blue cysts, which may rupture and discharge a material resembling old blood. Section of the tumor nodules shows these cysts to vary in size and shape, some containing old blood and separated from each other by glistening bands of fibrous tissue in which there may be fresh hemorrhage or old blood pigment. Microscopic examination shows the cysts to be dilated, irregular, round or oval glands arranged singly or in groups and lined by columnar or flattened epithelium; containing old blood and cellular detritus. These nests of glands are immediately surrounded by a loose cellular connective tissue set in a stroma of dense fibrous tissue interspersed with bundles of nonstriated muscle fibers, giving the suggestion of endometrial tissue.

Cullen² in 1916 reviewed all reported cases of adenomyomas of the umbilicus, deciding that only nine cases were authentic which included one case of his own. This excluded four cases reported by Wullstein, Giannettosia, van Noorden and Mentz. Köhler²¹ in 1927 reported what he claimed was the thirty-second case on record.

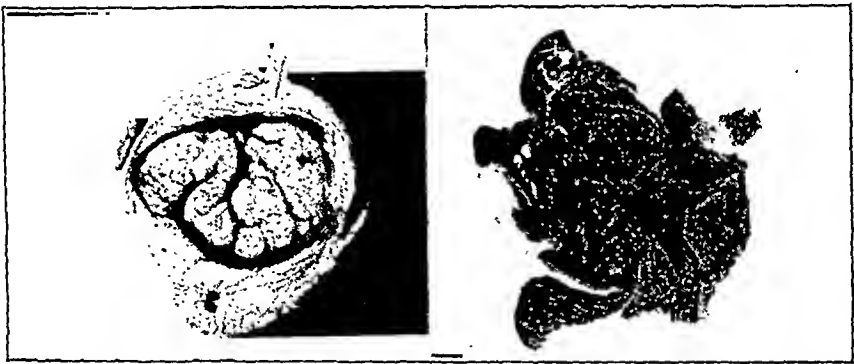


Fig. 1.—Gross specimen after removal.

Enzer¹⁰ in 1930 brought the total number of cases reported including his own case up to a total of forty-one. Since this recent article, I have been unable to find any additional cases, hence, with my own case now making a total of forty-two cases.

Suffice it is that these tumors are comparatively rare, and for that reason and because of their great interest, I wish to present my case as an addition to the preceding work.

CASE REPORT

A woman, forty years of age, came to the hospital complaining of an umbilical tumor which had been present for eleven years. She was married and had one child eleven years of age, following which pregnancy she had noticed a swelling in the navel, but it had caused no trouble until three years ago when it began to enlarge rapidly and cause pain at her menstrual periods, the enlargement and pain subsiding between periods. No discharge had occurred at the menstrual periods.

On examination a papillomatous mass about the size of a hickory nut and covered with a somewhat thickened intact skin was found attached to the umbilicus. This was excised, the incision extending through the peritoneum, so that the adjacent peritoneal surface was removed with the tumor. Section showed a papillomatous tumor mass 3 by 1.5 cm.; covered with a thick layer of squamous epithelium, in the center of which was a spongy tissue with numerous follicle-like spaces, varying in size up to 1 mm. in diameter, many of which contained hemorrhagic material and old

blood. A fibrous tissue core extended down meeting a conical dimple of the peritoneal tissue. On histologic examination the squamous epithelium was intact and normal, scattered throughout the underlying stroma of connective tissue and smooth muscle fibers were cystic spaces with flat epithelial lining and oval, round or irregular dilated glands, with columnar epithelium, occurring singly or in groups, and set in a characteristic fine cellular connective tissue stroma, giving the glands and stroma the appearance of uterine mucosa. Cellular detritus and blood pigment was present here and there in the lumen of the glands and in the stroma. The peritoneal surface was of considerable interest at its point of dimpling into the above tissue. The peritoneal

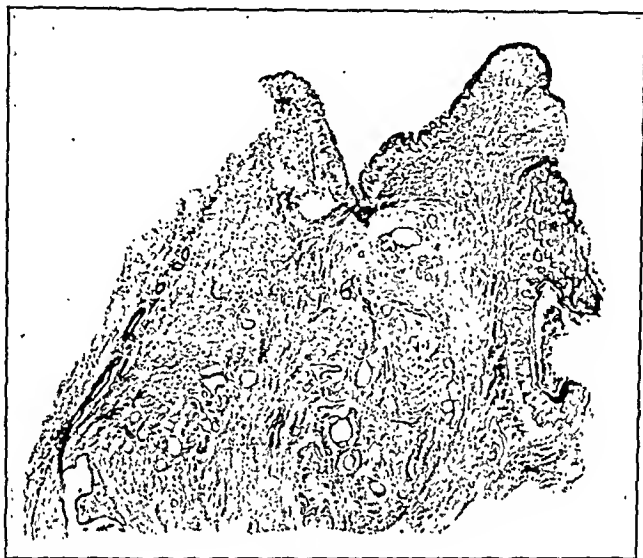


Fig. 2.—Microphotograph, showing numerous glandular and cyst spaces under the squamous epithelium.

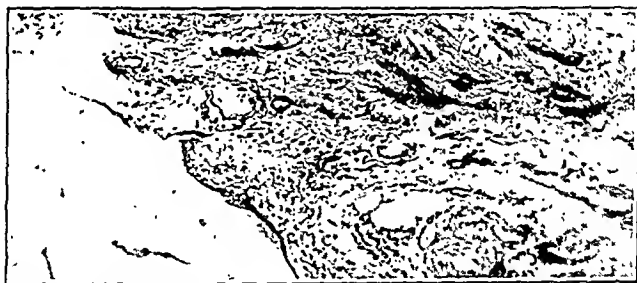


Fig. 3.—Microphotograph, showing the hyperplasia of the underlying peritoneum.

cells were hyperplastic, ranging from cuboidal to columnar in structure. At the apex of the dimple the peritoneal cells become flattened out extending into the surrounding tissue and giving origin to a gland-like structure; the walls of which were formed in part by flattened epithelium and in part by columnar cells identical with the hyperplastic cells of the peritoneum. The surrounding tissue was scanty, being composed of a few small stroma appearing cells. Several other small gland structures were present nearby but no definite connection could be seen with the peritoneum, although formed by identical appearing cells.

COMMENT

Thus it is seen that a tumor occurring in women which enlarges and often discharges bloody material at menstrual periods, and which shows the structure of

uterine mucosa with its typical glands and characteristic stroma, and further by the formation of cyst spaces filled with old blood, can well be classed as an adenomyoma of endometrial origin.

The case presented parallels the case described by Enzer¹⁰ in that it gives a histologic suggestion of its possible origin from the peritoneal cells by a process of metaplasia.



Fig. 4.—Microphotograph, showing the cystic and glandular structures surrounded by fine stroma cells, connective tissue and smooth muscle. Several of the glands are filled with red blood cells and cellular debris.



Fig. 5.—Microphotograph, showing the columnar epithelial formation of glands, surrounded by a loose endometroid stroma.

The evidence however is in favor of the origin of this type of endometrioma as arising from the primitive basal coelomic epithelial cells, which may remain in post-fetal life scattered in the serous epithelium and possessing the primary function of reproduction.

Heterotopias arising from remnants of the entoderm tract in the umbilicus do occur but do not give the clinical and pathologic picture of attempted menstruation as do the endometriomas.

Cysts of the urachus are not to be confused with this group of heterotopias, even though they may contain old blood and cellular débris. Urachal cysts are practically always lined by stratified epithelium and are usually connected to the bladder by a definite remnant of the allantoic stalk.

Metastasis by way of the venous or lymph systems has never been definitely proved.

The implantation theory by menstrual reflux seems highly improbable and without conclusive evidence.

If endometrium can be transplanted it is hardly likely that smooth muscle will be carried with it. Meyer, Nicholson and others have expressed the opinion that the smooth muscle fibers may be derived from the local tissue resulting from a metaplasia of the surrounding connective tissue. This has never been proved, however, not even in the presence of endometrial glands. The probability of implantation of endometrial gland cells alone with the derivation of the stroma and smooth muscle cells from another source appears very unlikely as it would be much more simple to have a unicentric origin for all components of the tumor.

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DYSTOCIA DUE TO CONTRACTION RINGS OF THE LOWER UTERINE SEGMENT, WITH A REPORT OF THREE CASES*

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BECAUSE of the relative frequency with which we, in our experience at The Brooklyn Hospital, have encountered contraction rings of the lower uterine segment as a cause of dystocia and the rarity of its mention and description in the literature, it was thought that a brief description of three cases in which they occurred might be of interest. While such a condition is met with in anterior positions only with the greatest rarity, that they do occur is well illustrated by the first case. In an occasional labor where the breech is presenting, we have been surprised to find it entering as a factor of difficulty. By far the greatest proportion of cases in which this troublesome complication has developed has been those in which the vertex has presented with the occiput posterior.

A probable explanation for this frequency with which we encounter these contraction rings in contrast to their rare occurrence in the experience of others, lies in the method advocated and practiced by the late Dr. Ralph Pomeroy of dealing with persistent occipitoposterior positions. In this method, the hand is introduced through the cervix late in the first stage or occasionally early in the second stage of labor, the vertex is grasped and pushed up above the pelvic inlet and rotated through an arc of 180 degrees to the anterior position of the same oblique. Under ordinary circumstances this maneuver is accomplished with relative ease, but in the presence of a contraction ring a firm band of the lower uterine segment is found to be clamped tightly around the baby's neck and the fingers are passed under the lower edge of this ring only with extreme difficulty and the vertex cannot be pushed upward until this band has been relaxed by very deep anesthesia. This intranterine manipulation after a greatly prolonged first stage, has many times definitely revealed the presence of a condition which otherwise might only be surmised.

CASE 1.—Mrs. B. W., aged twenty-six, para i, was admitted to The Brooklyn Hospital June 2, 1926 after an uncomplicated pregnancy. Pains had begun five hours previously, and the membranes had ruptured spontaneously at home two hours previously. Admission examination noted the vertex in the brim of the pelvis with a thick cervix one finger dilated, pains every three minutes with strong contractions.

*Read before the Brooklyn Gynecological Society, May 1, 1931.

Morphine gr. $\frac{1}{8}$ and scopolamine gr. $\frac{1}{200}$ were given hypodermically two and one-half hours after admission and repeated two and one-half hours later. The first real progress was noted almost eight hours after admission and eleven hours after the onset of labor. The vertex had made some descent, though not yet engaged, and the cervix was soft and open the size of a twenty-five cent piece. Morphine gr. $\frac{1}{8}$, scopolamine gr. $\frac{1}{200}$ were again given and later repeated. Hard labor continued for twelve hours more during which time the vertex descended a little, the cervix thinning, flattening and dilating to a diameter of three inches. Rectal ether was attempted, but not retained. Twenty-four hours after labor began, vaginal examination under gas-oxygen anesthesia with the entire hand in the vagina showed the vertex in the L.O.A. position. No disproportion between the fetal head and birth canal could be made out. Ether in oil with quinine was given by rectum and retained. Six hours after this vaginal examination another was done but the vertex had not descended much more. Cervix thinner, only a rim left, anteriorly and on the sides. A definite abdominal ridge was felt about two inches above the symphysis. This was at 5 A.M. of the day following admission. At 7:30 A.M. after thirty-four hours of labor, she was fully dilated, but the vertex remained high. Ether in oil was again given by rectum. At 10:30 A.M., three hours after full dilatation had been effected, vaginal examination showed the vertex to have descended, but not yet in mid pelvis. Frequent, hard contractions continued. Sodium bromide and chloral hydrate were given by rectum. Seven hours after the beginning of the second stage, the vertex was in mid pelvis, almost at the level of the spines and showing a tendency to come down with pains. Gas-oxygen analgesia was begun because of the severity of the pains. At 3:30 P.M. the vertex had reached the level of the spines and at 4:30 the sphincter ani was dilated. At 6 P.M. there had been no progress for three hours. A note was made that during a pain the vertex would move down and then slide back, as though pulled upward when the contraction relaxed. Forceps extraction was now decided upon. A hard pull was necessary to start the vertex, but thereafter the pull was an easy one. A right lateral episiotomy was done and the baby, weighing 8 pounds 8 ounces, delivered at 6:20 P.M., making the duration of labor forty-six hours, that of the second stage eleven hours. While the hand was never introduced sufficiently far into the uterus to definitely feel a contraction ring, all the evidence, i.e., extremely slow dilatation of the cervix; failure of the vertex to descend at a normal rate, though no disproportion between it and the bony birth canal could be made out; the absence of caput and marked moulding; the presence of a well defined "ridge" in the lower uterine segment palpable abdominally; and the retraction of the vertex upon relaxation of the contraction, points to this condition as the cause of her dystocia.

CASE 2.—Mrs. M. B., aged nineteen, para i, was admitted to the Brooklyn Hospital Dispensary July 10, 1930. Her date of expected confinement was computed to be January 9, 1931. Pelvimetry showed a justominor pelvis. She manifested no toxic symptoms, there was no prepartum bleeding, urine was consistently negative and blood pressure ranged from 104/50 to 120/70. At the end of the eighth month the presenting part could not be determined. She was admitted to the hospital at 11:30 A.M., January 4, 1931, with a history of rupture of the membranes four and one-half hours previously and slight bloody show, pains at fifteen to twenty minute intervals. Upon examination the fundus was found to be two fingers below the xiphoid, back left, fetal heart left lower quadrant. At 4:30 P.M. pains were every two or three minutes, fairly distressing, with good contractions. At 11:30 P.M., twelve hours after admission, vaginal examination revealed a breech in mid pelvis with the cervix soft, thin and open between three and four fingers, good progress for a primiparous breech. At 7 A.M. the breech was visible with pains. Crowning of the breech with-

out further descent continued for four hours when, after all efforts to get the fingers or a bandage around the groins failing, an unsuccessful attempt was made to push the breech up, pull the feet down and extract. It was then discovered that a strong contraction ring was firmly clamped around the baby's body. It was only after thirty minutes of deep, open mask ether anesthesia that there was sufficient relaxation of the contraction ring to allow the breech to be broken up and extracted. There was some difficulty with the shoulders, but none with the aftercoming head. The eight and one-half pound baby was stillborn, the fetal heart having been last heard just before the extraction was begun. The mother was in moderately severe shock.

CASE 3.—Mrs. J. C., aged twenty-five, para i, after an entirely uneventful prenatal course, was admitted to the Brooklyn Hospital September 25, 1925, several hours after rupture of the membranes. Active labor began at 2:30 A.M., September 26, with the vertex dipping into the brim. Pains with contractions occurred irregularly from five to fifteen minutes for twelve hours, at the end of which time a rectal examination showed the vertex still rather high, cervix edge thick and dilated to the size of a silver dollar, position not made out. On vaginal examination twenty hours after the onset of labor, the vertex was found to be entering mid pelvis, the cervix fairly thick and open between two and three fingers, position L.O.P. After thirty hours of fairly active labor and with descent of the vertex and dilatation of the cervix having remained relatively stationary for eighteen hours, it was decided to manually rotate the vertex above the pelvic inlet from L.O.P. to R.O.A. In the execution of this maneuver the presence of a stiff contraction ring was noted. Deep ether anesthesia was necessary for its relaxation and the accomplishment of the rotation. The bony pelvis was ample and the dystocia was due entirely to the contraction ring. Two hours after rotation, contractions were reestablished. These continued every ten to five to two minutes until full dilatation. Vaginal examination six hours after rotation showed the vertex to have redescended to high mid pelvis in the R.O.A. position with good flexion and the cervix three inches dilated. Approximately forty-two hours from the beginning of labor and fifteen hours after rotation, full dilatation of the cervix with the vertex on the perineum had been accomplished. The second stage was of one hour and ten minutes' duration, during which the sphincter ani was dilated, median episiotomy and forceps control were done after a good crown. Mother and baby were in good condition following delivery. The baby weighed seven pounds twelve ounces. During this long and tedious labor, narcosis and analgesia were secured by the use of sodium bromide and chloral hydrate by rectum late in the first stage. Eight doses of morphine and scopolamine were given over a period of thirty-six hours; gas-oxygen analgesia from full dilatation until complete anesthesia for delivery. A mild degree of toxemia was suggested by slight edema of the ankles and a blood pressure of 155/105 on admission and an intrapartum rise to 210/110 at one time, but was not substantiated by subsequent laboratory findings. The blood pressure did not go above 130/75 postpartum.

A résumé has been given of a case in each of the presentations and positions ordinarily encountered in the conduct of labor, in which a contraction ring of the lower uterine segment has entered as a complication sufficiently serious to greatly prolong the labor itself and endanger the life of mother and child. After many years of observation instigated by the late Dr. Pomeroy, we feel that this is a definite and not uncommon clinical entity, frequently overlooked and leading to real dystocia.

(For discussion, see page 612.)

ORAL ADMINISTRATION OF SODIUM AMYTAL IN ECLAMPSIA*

BY E. C. HAMBLÉN, M.D., AND D. O. HAMBLIN, M.D., UNIVERSITY, VA.

(From the Department of Obstetrics and Gynecology, University of Virginia Hospital)

THE employment intravenously of sodium amytal in the treatment of eclampsia has been described by a number of clinicians.^{1, 2, 3} Experimental studies of its effect on liver function, secretion of urine, and alkali reserve of the blood⁴ and of its effect on the fetus⁵ have shown no contraindications to its use in eclampsia. Our results with its intravenous administration to control convulsions in twenty patients with eclampsia during the last year have been satisfactory. Oral use of sodium amytal in these cases was suggested from our experience⁶ in administering it in normal labor. We believe that the substitution of an oral method for an intravenous one is always desirable where it is possible. Oral administration of sodium amytal in eclampsia would seem to have additional advantages: (a) the drug could be given in emergencies where the intravenous technic was not feasible; (b) this fact would extend its use by the general practitioner; (c) and the result would be a decreased incidence of the use of morphine, large doses of which, we believe, materially increase fetal and maternal mortalities in eclampsia. We present the study of 6 patients† with eclampsia whose only sedation was received from the oral administration of sodium amytal.

Treatment.—The essentials in treatment of these patients have been the same in all cases. Each patient immediately after admission has received 15 to 18 gr. of sodium amytal. Only one of the 6 patients was able to take the capsules by mouth; the drug was administered to the remaining 5 by nasal catheter. Subsequent doses were administered 3 to 6 gr. at a time approximately every four hours for a period of twenty-four to thirty-six hours, indications for each dose being restlessness or a rise in blood pressure. After the administration of 30 to 45 gr., it was found that a deep sleep could be maintained by 3 gr. doses at increasingly wider intervals.

Hypertonic glucose was given intravenously to each patient in amounts sufficient to establish satisfactory diuresis and to combat any tendency toward acidosis. In Case 6, where the patient presented a low blood calcium on admission, calcium gluconate was given intravenously. As soon as the blood pressure curve had begun to decline, diuresis had been

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†Since submission of this article, our studies of eight additional patients with eclampsia, receiving only oral sodium amytal for sedation have yielded similar satisfactory results.

established, and the patient could take fluids by mouth a diet consisting of 2000 c.c. of milk with an additional 1000 c.c. of fluids other than milk was given.

Adjuvant measures included: free catharsis with magnesium sulphate; diet with maintenance protein on the sixth to seventh day; and absolute rest and quiet.

Clinical Progress.—Convulsions were controlled immediately with the initial dose of sodium amytal. There were no recurrences of convulsions as labor began or progressed or in the puerperium. In Case 1 the patient did not go into spontaneous labor until four days after the last convulsion, during which time there was marked improvement of the toxemia.

The postpartum progress of these patients was satisfactory. Diuresis was established by the end of the second day of the puerperium. Edema subsided within several days. Blood pressure gradually fell to normal levels. A rise of the blood pressure usually responded well to a slight increased dosage of sodium amytal with more complete sedation.

RESULTS

1. In all 6 patients convulsions were immediately controlled by oral administration of sodium amytal without adjuvant narcotics or sedatives.

2. After convulsions were controlled, sedation was maintained with relatively small doses of sodium amytal.

3. None of the patients exhibited the depression of respiratory rate or the cyanosis which have been observed frequently in patients receiving large doses of morphine.

4. No inhalation anesthesia was required for delivery of the patients.

5. The babies were in good condition at delivery and required no vigorous resuscitation.

CONCLUSION

We believe that it may be inferred from these 6 cases that the convulsions of eclampsia can be controlled promptly and completely by the oral administration of sodium amytal without untoward effects on the mother or baby.

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“ASCENDING” INTRAUTERINE POLYP

BY R. A. LIFVENDAHL, M.D., CHICAGO, ILL.

(From the Department of Gynecology of the Post Graduate Hospital and Medical School)

THE term “ascending intrauterine polyp” is suggested to denote the upward, rather than the usual downward, growth of a polyp within the uterine cavity. In most cases these submucous tumors have been described as projecting towards the internal os, into the cervical canal, or lying free in the cavity, after spontaneous amputation. In this specimen the direction of growth has been towards the cavity, where the resistance is less as compared to the surrounding uterine musculature. As usual, the accompanying dysmenorrhea associated with attempts of the uterus to expel this “foreign body” was present in this patient.

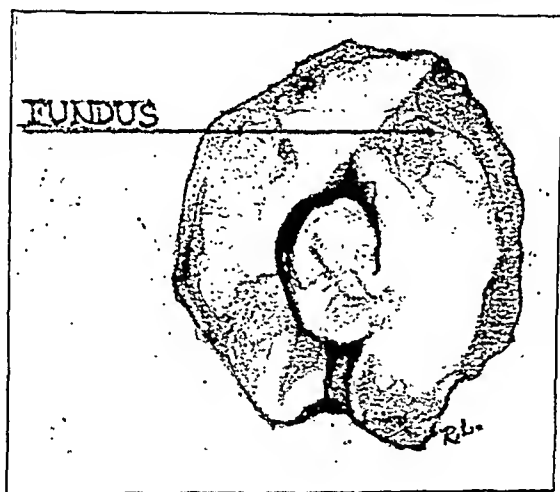


Fig. 1

CASE REPORT

White woman, aged forty-three years. Her menstruation began at fourteen, at monthly intervals, three days' duration until her marriage at twenty-six and since, four to six days, more profuse, and contained considerable clotted blood. Low abdominal cramps and a lumbar backache present on the first day. Three years and then again nineteen days before the supravaginal amputation of the uterus, the pain on the first day of menstruation was so severe that, with the accompanying periumbilical pain, abdominal distention, and inability to pass gas per rectum led to a preliminary diagnosis of intestinal obstruction, by another physician. However, after enemas, the intestinal symptoms subsided. Before operation bimanual examination revealed an old bilateral laceration of the cervix with slight ectropion of the cervical mucosa, the corpus uteri anteverted, movable, enlarged to the size of a six weeks' pregnancy, and of a hard consistency, but no distinct fibroma was palpable. The left appendages were adherent.

Examination of Specimen.—The corpus uteri measured 5 cm. longitudinally and transversely and had an anteroposterior diameter of 3.5 cm. The wall was symmetrically and uniformly thickened up to 1.8 cm. and showed no local "work-hypertrophy" although the tumor was not in a symmetrical position in relation to the direction of uterine muscular contractions. Originating 2 to 3 mm. above the internal os, on the left side, was a 1.8 by 1.2 by 1.8 submucous fibromyoma having a pedicle 1 cm. in diameter which extended upwards into the uterine cavity (Fig. 1). The surface of this fibroid was yellowish gray mottled with dark red and microscopically represents hyperplastic endometrium. Similar mucosal changes were present in the remaining endometrium except where the tumor was compressed, here the mucosa was thin and the glands were arranged in an oblique direction.

SPONTANEOUS RUPTURE OF THE UTERUS AT THREE AND ONE-HALF MONTHS' GESTATION

BY ROBERT S. SMYLIE, A.B., M.D., SANTA CRUZ, CALIF.

SPONTANEOUS rupture of the uterus in young, healthy primiparae during the first four months of gestation is exceedingly rare and exceptionally few cases have been reported excluding those cases with infantile uteri.

The case reported herewith presents some unusual features both from the standpoint of history and findings at autopsy.

R. E., colored, aged nineteen, married. Admitted to the hospital Sept. 23, 1929. The history obtained was meager and difficult to elicit. Shortly after midnight of the day of admission patient was awakened from sleep by a severe abdominal pain. She was given a drink of whiskey, and a hot water bottle was applied to the abdomen without relief. Her condition gradually became more grave and a local negro physician was called who told the patient she was threatened with an abortion, and according to the statement of the husband left some medicine and took his departure.

Patient was seen at 11:00 A. M., at which time she was in profound shock with moderate rigidity of the entire abdominal wall and extreme tenderness over the entire abdomen. There was a rounded palpable mass, fluctuant, almost the size of a small adult head and extending to the level of the umbilicus.

Diagnosis of ruptured uterus was made, ambulance was called, and the patient was taken immediately to the hospital, where she died ten minutes after admission.

Autopsy revealed nothing of importance with the following exceptions. The left lung was almost completely collapsed. The right one contained only a small amount of air. Cut section showed a wet, congested surface but nothing further worthy of note. Microscopic section revealed many dilated vesicles. The abdominal cavity was distended by much blood, the amount being impossible to measure. There were many clots especially in the peritoneal recesses. Extending to the level of the umbilicus was the intact amnion containing a fetus corresponding in size to a three or four months' gestation extruding from a rupture of the uterine fundus. At the juncture of the amnion with the uterus, was much clotted blood and placental tissue. The length of the uterus from the edge of the rupture to the cervix was 16 cm. Diameter of the amniotic sac was 15 cm. Upon opening the uterus its cavity was found to be filled with clotted blood. The placenta was attached to the left lateral wall of the uterus. The adnexa were negative. Microscopic section revealed the placental units intact. Some syncytial cells were seen in a few places, and a few polymorphonuclears near some clotted blood. Section of uterine musculature at the site of rupture revealed nothing abnormal. The bronchial lymph glands were all

greatly enlarged and on section showed a black pigment and a cheesy content. Microscopic section exhibited large areas of caseation with surrounding giant and epithelioid cells. No miliary tubercles were seen.

A subsequent visit to the patient's home for the purpose of obtaining further history from the immediate family was productive of nothing further of importance other than the patient had never had any severe illness and had had no previous pregnancies. There had been no attempts at abortion during the present pregnancy. There was no history of any sort of trauma nor any account of any unusual exertion by the patient. The husband denied any venereal history in either his wife or himself.

If the patient's condition had been correctly diagnosed at the time of onset of symptoms or shortly thereafter, prompt surgical intervention would in all probability have obviated the fatal outcome.

MEDICO-DENTAL BUILDING.

INTRAPELVIC TUBAL INSUFFLATION SYRINGE*

By FRANSIS W. SOVAK, M.D., F.A.C.S., NEW YORK

(From the Gynecological Department of The University and Bellevue Hospital Medical College)

FOR the past year we have been interested in tubal reconstruction, not primarily as a problem in sterility, but with the idea of developing a technic in operations upon occluded tubes, so that they would remain patent after operation.

A preoperative salpingogram will establish the patency or nonpatency and the site of occlusion in either or both of the tubes, but it is necessary at the time of the operation to know the exact site of the occlusion or kinking of the respective tube. Also in those patients who have not had any preoperative study, it is well to know whether the tubes are patent or occluded at the time of operation.

The use of a fine probe traumatizes the tubal mucosa and frequently produces false passages. Arthur Curtis suggested the use of a small glass syringe to test the patency of the tubes intrapelvically. The use of the small syringe with the short tip and small air capacity was not very practical in all cases.

We have devised a syringe in two sizes $\frac{1}{4}$ and $\frac{1}{2}$ ounce, with a long shank having a beaded tip or a bead near its outlet. The beaded tip is nontraumatic, and the tube is rendered air-tight by gentle pressure upon it with the fingers just behind the bead. This bead also prevents the syringe from slipping out of the tubal canal. The long tip of the syringe is either straight or bent at right angles, in order that insufflation may be done in any position in which the tube may lie.

Gentle pressure is exerted upon the rubber bulb, and if the tube is patent, there is a sort of gurgling sound as the air enters the uterus, and if the uterus is held in the hand, a vibratory movement is transmitted to the fingers. If the tube is occluded or kinked the portion of the tube proximal to the occlusion will be markedly dilated as shown in the illustration. When the reconstruction operation is completed, the tube is again tested for its patency in a similar manner, thus giving us knowledge as to the success of the complete operation.

Gentle and steady pressure must be employed, as a sudden and sharp blowing up of the tube may produce an emphysema of the broad ligament. We have never seen a

*Read at a meeting of the Section on Obstetrics and Gynecology, New York Academy of Medicine, May 26, 1931.

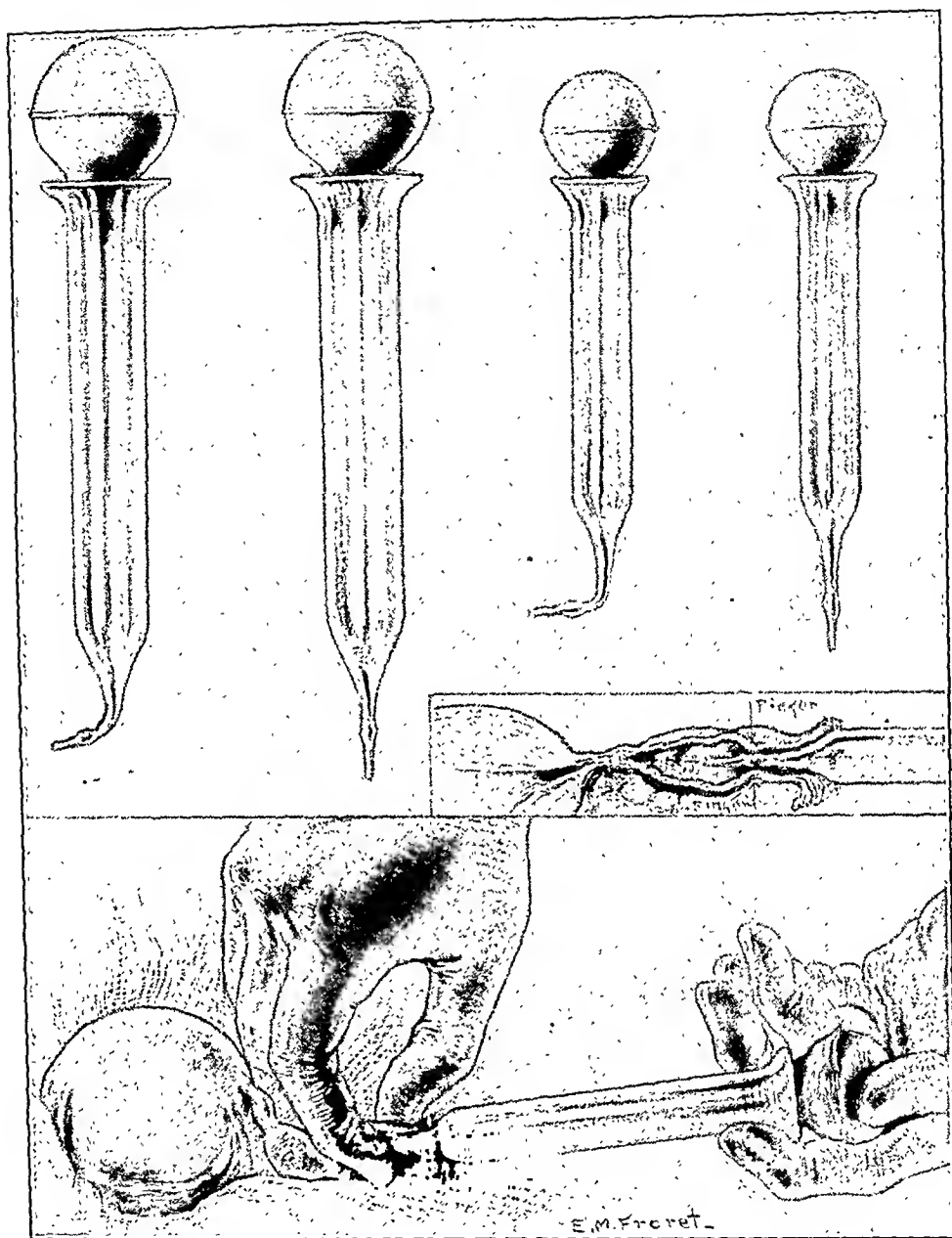


Fig. 1.

tube rupture in any other situation. This accident, however, is of no consequence, and we have not noticed any ill effect following it.

The advantages of this syringe are as follows: It is simple, inexpensive, easily sterilized, not readily breakable, and it quickly gives the operator the diagnosis of patency or nonpatency, and the site of occlusion of the tubes; does not traumatize and by forcing air into the uterine cavity, obviates any possible chance of spilling or blowing endometrial fragments into the pelvis.

I wish to thank Becton, Dickinson and Company for their kind assistance in devising this syringe.

117 EAST SEVENTY-SECOND STREET

A CLINICAL ESTIMATION OF THYTNITARY AS AN OBSTETRIC AID

By RAYMOND P. WIESEN, M.D., MILWAUKEE, WIS.

THERE are two commercial preparations of thymus-modified pituitary extract, the first to be used was a European extract marketed under the name of "Thymophysin," the second an American product marketed under the name of "Thytnitary." The later product was used in my series of 25 primiparous and 25 multiparous labors.

In the series of 25 primiparous labors, thytnitary was not given unless a primary or secondary inertia had developed. The earliest any injection was given in this series was three hours extending up to fifteen hours after the beginning of labor. The dilatation varied from 1 to 7 cm., with an average of 4 cm. (2½ fingers). In 24 of these cases the results were satisfactory. In from five to ten minutes with an average of eight minutes, there was a marked increase in the strength of the contractions as well as the frequency. In each case of this series the labor continued on to delivery in an unusually short time. The shortest time from the injection to complete dilatation was fifteen minutes, and the longest four hours and twenty minutes with the one exceptional long case of ten hours. The average time was one hour and forty minutes. The total average duration of labor in this series was ten hours and fifty-five minutes, however the average time the patient was in labor before the thytnitary was given was seven hours and fifty minutes. In none of these cases did thytnitary cause injury to the infant. The percentage of lacerations was the same as in normal deliveries. The placenta in most cases came out easily and unusually early, the earliest was one minute, the longest and adherent Duncan type placenta was forty-two minutes with an average time of nine minutes. The amount of thytnitary used was one-half cubic centimeter in all but one case.

In the series of 25 multiparous labors, thytnitary was given for either primary or secondary inertia. The earliest any injection was given in this series was thirty minutes extending up to twelve hours and forty minutes. The dilatation varies from 1 to 5 cm. with an average dilatation of 3 cm. (two fingers). The results were satisfactory in all cases. The shortest time from the injection to complete dilatation was ten minutes; the longest time was two hours, with one exception that being a persistent right occipitoposterior; the duration of labor was seven hours after the injection was given. The average for this series of multiparous labors was one hour and forty minutes. The total average duration of labor in this series of multiparous labors was seven hours and thirty-six minutes, however the average time the patient was in labor

before thyuitary was given was six hours. The average duration of the third stage was seven minutes. The amount of thyuitary used was one-half cubic centimeter, in all but three cases where 1 c.c. was used. In none of these cases did thyuitary cause injury to the infant. The percentage of lacerations was the same as in normal deliveries.

CONCLUSIONS

It is readily seen that the length of labor in the above series must not be compared with continental European experience, because obstetricians there use a similar preparation in all cases, normal as well as abnormal, at the inception of labor, to hasten dilatation. Their claims of labor usually terminating in three to four hours, are doubtless made possible by this technic, which, of course, is considered ultraradical in this country at this time.

The average elapsed time of labor in these cases, however, was reduced approximately 50 per cent from our expectancies based upon our experience with the same class and kind of cases where thyuitary was not employed.

The statement that thyuitary has a specific and first effect upon the cervical musculature seems to be substantiated by the fact that in these 50 deliveries, there was absolutely no evidence of unusual cervical injury, and yet there was a much greater muscular motility observable and a distinct acceleration of dilatation.

The statement that results parallel with those secured by the use of thyuitary may be obtained by using small doses of pituitary extract seem to be disproved. In fact in a small series of cases I have used small doses of pituitary extract in the first stage of labor and found it to be very unsatisfactory.

It is my belief that a proper and intelligent use of thyuitary will go far toward avoiding long-drawn-out labors with their concomitant surgical termination.

1348 NORTH TWENTY-SEVENTH STREET

AN ATOMIZER FOR VAGINAL ANTISEPSIS DURING LABOR AND VAGINAL MEDICATION IN GYNECOLOGIC PRACTICE

CHARLES EDWARD ZIEGLER, M.D., PITTSBURGH, PA.

OBSTETRICS is classified as surgical rather than medical practice and obstetric technic is regarded as surgical technic. And yet until recently no serious attempt has been made to sterilize the birth canal, the field of operation in obstetrics. This is in marked contrast to the procedure in other branches of surgical practice and may very well explain the persistently unfavorable results in obstetrics. The obstetrician not infrequently invades, traumatizes, and lacerates the unprepared and at times infected birth canal. The gynecologist, in contrast, routinely prepares the vaginal field. He scrubs, irrigates, and applies antiseptics to cleanse and sterilize the tissues before cutting into them.

It is more and more apparent from the rapidly accumulating evidence in the literature of the subject, that the vagina of every woman in labor must be regarded as potentially infected, in that it may contain pathogenic bacteria. In from 25 to 55 per cent of cases, dependable bacteriologic studies seem to indicate that positive cultures may be secured from the vagina after the beginning of labor. The bacteria increase with the duration of labor, with the length of time the membranes have been ruptured before delivery, with the number of vaginal examinations, and with operative deliveries.

How the bacteria reach the vagina, if they are present when labor begins, and who is responsible is not so important. But it is important that every effort be made to get rid of them, to sterilize the birth canal before the forces of labor and surgical intervention produce the inevitable abrasions, contusions, and lacerations of the infected tissues.

According to Mayes,¹ the vulva and vagina of every woman should be sterilized at the beginning of labor and as often thereafter as may be necessary to keep the parts sterile until the completion of labor. During the past five years he has sprayed the vulva and instilled into the vagina, a 4 per cent solution of mercurochrome in over 9,000 cases, with very gratifying results.

Mayes instills the mercurochrome with a glass syringe and depends upon his gloved fingers "to work it into the folds of the mucous membrane and about the cervix." Investigation of his method shows that it cannot be depended upon to apply the solution thoroughly to every part of the canal. Isolated areas are often found untouched, even after the most painstaking effort to reach them. The attempt, moreover, is frequently uncomfortable to the patient and in primiparae especially, may arouse so much resistance that the working-in process must be given up.

With the expectation that Mayes' results could be improved if the objections to his method were overcome, the author designed an atomizer for spraying the parts. Following its use with one of the dye antiseptics (mercurochrome, pyridium), it was found repeatedly on inspection, that every part of the vaginal walls and cervix was thoroughly covered and dripping wet with the solution. This atomizer has been used on a considerable series of labor cases at the Elizabeth Steel Magee Hospital in Pittsburgh. A statistical study of the results is now being made.

THE VAGINAL SPRAY IN GYNECOLOGIC TREATMENT

Certain gynecologic treatments in the form of topical applications, in the pregnant or nonpregnant woman, may be conveniently and effectually applied by means

of the vaginal atomizer. Vaginal and cervical infections, such as those resulting from the *Trichomonas vaginalis* or the leucorrhœa from endocervicitis, offer indications for vaginal antiseptics. With the atomizer, thorough spraying with compressed air by the physician in his office may be supplemented to good advantage by sprayings administered daily or oftener by the patient herself in her home.

In preparation for gynecologic operations, it is suggested that spraying, with whatever solution may be the operator's choice, is less traumatizing and much more effective than the usual procedures now in vogue.

The successful operation of the vacuum atomizer is dependent upon certain conditions: there must be no interference with the forceful flow of air through the tip and the air in the spray must return unhindered to the atmosphere as fast as it separates from the solution which it carries. Ordinarily these conditions can only be fulfilled when exposed surfaces or well ventilated spaces are sprayed. This explains why the use of the atomizer in medicine has been limited for the most part to the treatment of nose and throat affections and the spraying of the body

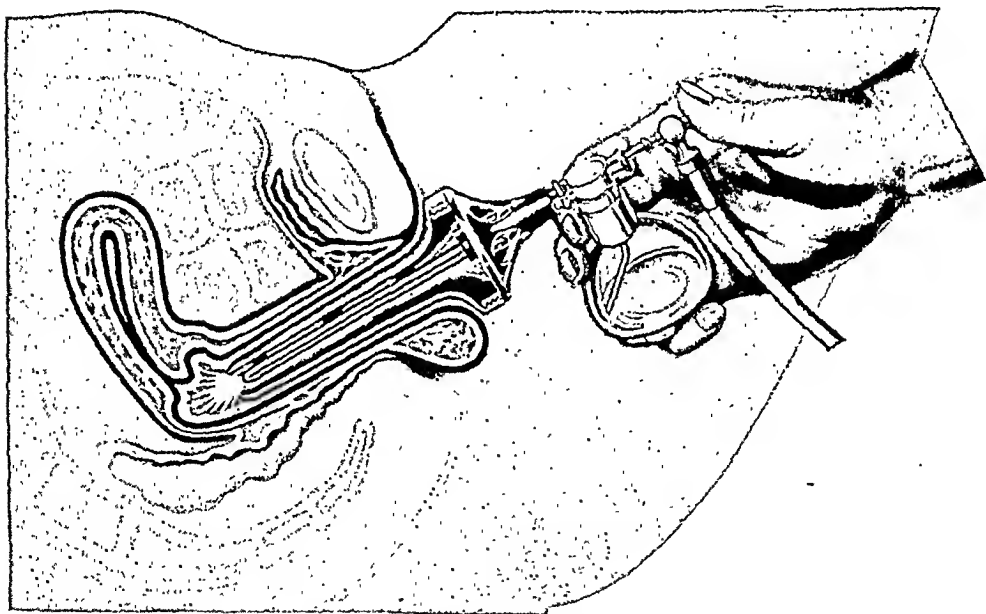


Fig. 1.—Showing the atomizer in operation with compressed air. The arrows indicate the way in which the air escapes during spraying.

surfaces, and why in its usual form it is not adapted for use in spraying a body cavity with collapsed walls and a constricted outlet, as the vagina. The canal is obliterated by the approximation of its walls and the resistance to their separation is too great to be overcome by the force of the spray. The vagina may be distended by forcing more and more air into it, but the air carries no fluid because of back pressure through the atomizer tube from the accumulation of air within the vagina.

The device here described consists of the usual atomizer, with an elongated metal tip encased by a much larger, tapering tubular tip adapted for easy insertion into the vagina. The encasing tip projects well beyond the end of the atomizer tip, to protect the opening in the latter from closure by contact with the vaginal walls and to provide a space into which the fully developed spray may be delivered without interference.

The annular space between the atomizer tip and the encasing tip communicates with the vent holes in the latter and provides for the escape of the air into the atmosphere as it separates from the liquid during spraying.

The encasing tip is made of bakelite in two parts which are screwed together, and is attached to the head of the atomizer bottle by means of a spring clip (Fig. 1). This construction makes it easy to take apart for cleaning and sterilizing. The bakelite parts may be sterilized by boiling and are not affected by chemical sterilizing agents and antiseptics.

The operation of the atomizer is simple, as illustrated in Fig. 1. The source of air pressure may be either compressed air or the atomizer bulb.

Good exposure of every part of the vaginal walls and cervix to the full force of the spray is accomplished by spraying continuously while moving the tip of the atomizer repeatedly in an inward and outward direction, deep insertion alternating with almost complete withdrawal, separating every fold and seeking out in order again and again, every section of the canal. As there is no building up of back pressure within the vagina, there is no abatement in the force and penetration of the spray.

TECHNIC.—The vulva is shaved, carefully washed with wet sterile gauze and dried. The parts are not flushed or irrigated, to prevent washing contamination into the vagina.

The sterilized bakelite tip is attached to the atomizer, the bottle of which holds an ounce, the amount of solution to be used. The external parts, including the anus, are sprayed first. The labia are then separated, the introitus sprayed, and the tip inserted into the vagina which is to be sprayed in the manner previously described. It is only necessary to remember that the spraying must proceed without interruption, as the open end of the tip, through which the spray is delivered, passes again and again over every part of the vaginal walls and cervix.

When the bottle is empty, the tip is withdrawn, the encasing tip is detached, and the external parts are dried with air forced through the atomizer. The parts are not covered after spraying.

Every woman should be sprayed at the beginning of labor and every twelve hours thereafter until the completion of labor. It is well known that infection may be concealed within the glands of the cervix and the organisms, notably gonococci, released as the glands are emptied through the ironing-out processes of dilatation and effacement of the cervix during labor. Hence, the importance of repeated sprayings with the prolongation of labor. It is especially indicated when vaginal examinations have been made and before operative interference of every kind, including cesarean section.

In hospital and office practice it is of great advantage to use compressed air because of the ease and rapidity with which the spraying is done. It is important, however, that the fluid be not delivered faster than the tissues will absorb and hold it. Perfect control may be provided by equipping the air tube with an air-pressure reducing valve.

In the home, where it is ordinarily difficult, if not impossible, to maintain asepsis during labor, the vaginal atomizer is ideal in its simplicity and effectiveness. While compressed air is not available, the atomizer bulb works just as well, even if at the expense of somewhat more time and effort.

Our experience has been limited to the use of mercurochrome, 4 per cent; pyridium, 1 per cent, and metaphen, 1:2500 solutions. They may be used freely within the vagina without ill effects to mother or baby.

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Editorial Comment

HONESTY IN PUERPERAL MORTALITY RATES

HIGH puerperal mortality rates in the United States have roused great interest among actual or potential mothers and among physicians of the country. Not infrequently the arguments offered, conclusions assumed, and even acted upon, have appeared to be emotional rather than rational, and occasionally hysterical rather than critical in quality.

During the period of agitation for the passage of the Sheppard-Towner Bill the entire press of the country gave free vent to the publicity brought out by the Federal Children's Bureau in which the United States was ignominiously listed as seventeenth in rank among civilized nations on the basis of crude maternal mortality rates. Countries of which it was known that little trust could be placed on the accuracy or completeness of their vital statistics, were ranked high above the United States in their consideration for the pregnant woman.

In view of the objective of pending Congressional legislation (the Jones-Bankhead bill), it is well to be on guard lest the testimony of so-called vital statistics be again invoked for propaganda purposes, as in the past, without a reasonable interpretation of the facts.

The puerperal mortality in the United States is not creditable to our standard of material well being, to our medical and associated professions and the facilities created for their care of maternity, nor to the adequacy of publicly supported measures for the protection of public health. The evidence of an unsatisfactory condition in the United States is supposed to be strengthened by some of the arguments commonly used, which assume entire comparability in the facts of maternal mortality as assembled from published statistics of other nations.

Our maternal mortality is excessive by just so much as any preventable deaths occur in connection with pregnancy. That there are preventable factors related to patients' status, to social and intelligence levels, and to the conduct of obstetric practice, there can be no doubt.

There has been no time in our history when so much attention through responsible professional bodies has been given to the discovery and correction of the various factors within medical control which may be trusted to reduce maternal mortality in the United States. These efforts will not be abated until proved preventable causes of puerperal mortality are brought under the closest practicable control. In the meantime let us be honest with ourselves and our neighbors and recognize the errors inherent in the use of international puerperal mortality rates.

Attention may therefore be directed to the publication in the current issue of the JOURNAL of an authoritative article on the subject. The careful reading of this should convince one of the futility of the argument of the comparatively high mortality rate of this country as a reason for the passage of federal participating legislation, the other claims for which may be regarded as of an equally false and misleading character.

Special Article

FACTORS LEADING TO MISINTERPRETATION OF MATERNAL MORTALITY RATES

BY HAVEN EMERSON, M.D., NEW YORK, N. Y.

(Professor of Public Health Administration, Columbia University)

PREVENTABLE puerperal deaths occur throughout the world, but international comparisons based on national mortality rates are misleading, and in the present state of governmental registrations of births and deaths and the published tabulations based on them, conclusions should not be offered or opinions expressed implying relative excellence in the obstetrical, medical, or midwifery services provided for national population groups.

Among the factors responsible for the nonecomparability of national mortality rates are several which, if disregarded in our calculations, permit serious injustices and obvious errors in deductions.

Reporting of births (living or still) varies greatly in completeness. Where stillbirths are added to live births (in this country commonly about 4 per cent) as the basis of a maternal death rate we may be in further error because of the great variation among the races of our nation in the frequency of stillbirths, the stillbirth rate among Negroes, for instance, being much greater than among the white races with us.

If we fail to note the number of children born in multiple births, which as a matter of experience exceed the number of confinements (twins, triplets, etc.) by about 3 per cent, we are led again into an appreciable error of calculation.

Where, as has been the case in some European countries, a birth is not reported as a living birth unless the child survives until it is baptised, which may not be for several days, the live birth basis for maternal mortality rates may be seriously distorted.

Major factors quite apart from questions of professional skill, and judgments before or at the time of confinement are, of course, the race, occupation, economic status, age at first and subsequent confinements and parity of the delivery from which death results.

Social and economic changes of unprecedented magnitude and swiftness have affected the mingling of race stocks in this country, the occupations of women prior to and during childbearing ages, the age at first confinement and the number of living and stillbirths in the average family.

It is well to consider the object of statistical expressions of maternal mortality. Are we concerned with the "cost in mothers' lives of bring-

ing into the world 1000 live-born babies''? (Woodbury: Children's Bur. Pub., No. 158.) Shall we estimate the risk of maternity in terms of deaths of women of marriageable age for every thousand pregnancies, whether these terminate in live births, stillbirths, miscarriages or abortions? Shall we express the mortality in pregnancy by the difference between the mortality among the childbearing and that of nonchildbearing women, as Lowrie has suggested? (N. Y. State Jour. Med., Oct. 1, 1931.)

As physicians we are primarily concerned with the advancement of the science and art of medicine to that point where a woman may be reasonably assured that she will not lose her life from a known preventable cause related to her pregnancy, if she puts herself under the care of a physician, whether she is delivered by the physician as a general practitioner or by an obstetrician, by licensed midwife, or by midwifery trained nurse, in hospital or in the mother's home.

As sociologists or health officers we are interested in the maintenance of a stable or slightly increasing population as the result of childbearing of married women, resulting in the birth of living and surviving children in excess of the deaths of the community, and with the lowest ratio of pregnancies to living births, and the highest survival rate of mothers.

As registration officers and statisticians our endeavor must be to obtain such complete accurate original records of births, deaths, stillbirths and perhaps ultimately of abortions and even of pregnancies, as will permit reliable comparison of maternal mortality among population groups from which evidence may be obtained which will help physicians to know all the preventable factors which determine the avoidable fraction of maternal deaths. We are concerned, moreover, with the tabulation and publication of analyses of the maternal mortality records so that governments and civil agencies dealing with health will be kept informed of the trends in death rates, and can with understanding take action in the public interest when the death rates fail to show improvement.

Among a thousand certificates of death with a puerperal cause stated, as received from the physicians at the registrar's offices of our city or state health departments, there will be about 400 in which the cause of death is stated to have been solely puerperal in character, without any contributing cause, the remaining 600 giving two or more causes of which one would be puerperal.

While the result of the use of the "International List of Causes of Death" pretty widely among the modern nations is to bring close agreement in the practice of classifying single causes of death, there is no uniformity in the procedure of the national registration offices in the matter of classifying certificates presenting multiple or joint causes of death.

Throughout the United States registrars follow closely the procedure recommended by the Bureau of the Census in its "Manual of Joint Causes of Death," in which preference is stated for the International

List number under which a death should be classified, when more than one cause is certified by the physician in attendance.

Contributory causes of deaths are of the greatest importance and their entry on the death certificate is to be encouraged where appropriate, but unless the procedure of classification of such joint cause certificates is substantially the same in other countries, much of the value of comparison in national death rates is lost.

If the 600 joint cause certificates out of an average 1000 recording maternal death, with at least one of the causes stated to be of puerperal nature, were submitted to the procedure of other countries, none of which has adopted such a complete and systematic classification practice as prevails in the United States, it would be found that while about 88 per cent of these would be charged to the puerperal cause in the United States, some countries, such as England and Norway, would probably charge only 64 per cent to a puerperal cause, only one of some sixteen countries referring a larger proportion of joint causes to the puerperal list than does the United States. In fact, in a series of typical joint cause certificates involving a puerperal element in the death, the practice of different countries would certainly vary by classifying the same certificates from 64 per cent to 97 per cent under the puerperal title, rather than under a nonpuerperal contributory cause. It must be obvious that with almost two-thirds of our puerperal death reports giving one or more contributory causes, a wholly trustworthy international comparison of maternal mortality rates must await uniformity in registration practice for joint causes of deaths. It is expected that an important advance in this direction will be made at the next Conference on International List of Causes of Death in 1939.

Quite apart from differences in registration practice and in the relative completeness of reporting births and deaths, are inequalities in the distribution of the people of the nations in rural, and in small and large urban areas, for each of which there are significantly different maternal mortality rates, those of the cities being almost uniformly higher than rural rates. Urban maternal mortality rates for both white and colored in the United States are about 60 to 75 per cent higher from puerperal septicemia and about 35 per cent higher from all puerperal causes than are rural rates. In the past thirty years the urbanization of the people of the United States and particularly of the young married people has increased at a rapid rate, probably a factor in our persistently high maternal mortality. Also while deaths are, in cities at least, reported with substantial completeness, the failure to report births even in some cities up to a million population, and within the past decade, has been found to fall short by 10 per cent or more of the true total of births, an added factor in a reported high maternal mortality rate based on total births.

Probably of all the changes in the past thirty years in the United States which has tended to develop high maternal mortality rates without implying neglect of attendance, has been the drop in the birth rate, with the inevitable increase in the number of primiparae in relation to the total pregnancies among married women, and the accompanying postponement of the age of first pregnancy, both of which factors tend to determine an increase in the maternal mortality rate.

If the maternal mortality rate per 1000 live births is 5 at twenty to twenty-four years of age of mother, it will increase to about 6 at twenty-five to twenty-nine, 7 at thirty to thirty-four and 10 at ages thirty-five to thirty-nine, increases prevailing according to age whether we deal with puerperal causes or use the rate from puerperal septicemia alone.

Similarly if we find a maternal mortality rate of 6 per 1000 first confinements, this will fall to 4 for second and to 2 for third confinements, thereafter rising to 4, 7 and 8 for fourth, fifth and seventh and eighth or later confinements. Apparently if the age of the wife at first pregnancy is over twenty-five years and she has on the average less than three children, she will run a greater hazard of maternal mortality than when the first and subsequent three or four confinements were earlier in life. In some of our northern states within the past five years one-third of all puerperal deaths have occurred among primiparae dying in their first pregnancy.

In view of the many variable factors entering into the end-result of maternal mortality rates in the modern nations, which can by no method or technic of tabulation or statistical estimates be reconciled to permit of significant comparison among the rates or their determining causes, it seems unsuitable to apply the international argument of higher rates in the United States than in other countries as a forcible reason for greater efforts at life saving here, or as evidence that the quality of medical care of the pregnant woman in the United States is of an inferior character.

The most effective type of analysis of maternal mortality is such as is undertaken by a state or city through cooperation between the health office in which maternal deaths are recorded within twenty-four hours of their occurrence, and the organized medical profession which through its obstetricians can obtain by committee or personal inquiry immediate, accurate, and complete information as to all the factors which led to the particular death under consideration.

We have the strongest possible arguments for intensive efforts to reduce the preventable factors of maternal mortality, from preliminary information that as many as two-thirds of the deaths in or from confinement in our large cities are due to causes which need not have occurred. In other words nearly two-thirds of the puerperal deaths may be found to be preventable in the United States today.

The preventable causes of maternal mortality are due in part to the injustices and inequalities of economic status of young married house-

holds, in part to the maldistribution and lack of organization of prenatal, delivery and postnatal care by obstetricians and their colleagues, the general practitioner, the midwife and still further to the application of examination and operative technic to the process of delivery by physicians more in the interest of speed of delivery and supposed comfort and convenience to the patient, than according to the physiologic needs and capacities of the mother to accomplish normal noninstrumental delivery herself.

Such studies as those now in process under the auspices of the New York Academy of Medicine in cooperation with the New York City Department of Health, including analysis of all factors bearing upon the causes of every maternal death occurring in New York City over a period of three years, will teach that particular community and its physicians more than can any statistic comparisons of more or less fallacious national mortality rates.

Husfeldt, E.: Pernicious-like Anemia During Pregnancy Due to Lead Poisoning. *Acta obst. et gynec. Scandinav.* 8: 25, 1929.

The author reports a case of pernicious-like anemia in pregnancy which was due to lead poisoning, the result of taking red oxide of lead as an abortifacient.

J. P. GREENHILL.

Daly, P. A.: Heart Disease in Pregnancy. *Illinois M. J.* 57: 205, 1930.

In the management of heart disease in pregnancy the condition to be avoided is heart failure. If decompensation does not occur during the prenatal state it seldom occurs during labor (less than 1 per cent at the Chicago Lying-In Hospital). Measures that can be used to prevent decompensation are regulation of voluntary work, proper rest, and the judicious use of digitalis if necessary. Early and constant observation is important, as well that delivery be made as easy as possible. Where the heart condition contraindicates future pregnancies cesarean section with ligation of the tubes is advocated.

FRANK SPIELMAN.

Society Transactions

CHICAGO GYNECOLOGICAL SOCIETY

STATED MEETING MAY 15, 1931

DR. LOUIS RUDOLPH presented a paper entitled *The Importance of Posture of the Cardiopath During Pregnancy and Labor*. (See page 546.)

ABSTRACT OF DISCUSSION

DR. DAVID HORNER.—Cardiopaths are notorious for the ease with which they deliver and always assume the most natural position for themselves. If left alone, the chances are with proper digitalization they will be able to go through the pregnancy, the labor beginning spontaneously and the expulsive effort being quite short. Only when decompensated do they require head elevation. If episiotomy is required it can be done under local anesthesia, maintaining Dr. Rudolph's reverse Trendelenburg. If there is an obstetric complication, which would require an extensive operation, one is almost compelled to give a general anesthetic. Ethylene in upright posture is least harmful of all, though I understand anesthesiologists like to give ether to the cardiopath.

DR. C. E. GALLOWAY.—In my experience at least these cardiac cases do better if you do not administer any pituitrin. We had five cases in which pituitrin seemed to be the offending factor in the case right after delivery. It has been thought that in the ampules once in a while there is a certain amount of histamine.

DR. RUDOLPH (closing).—Why do cardiopaths with or without cardiac failure feel better sitting up? The cardiorespiratory system is so correlated that a disturbance of the flow of blood to the heart will increase the work of the heart. The flow of blood from the splanchnic area and the upper extremities and the head is regulated by the so-called aspiratory action of the thorax. Keith has shown that with each respiration about 400 to 500 c.c. of blood flows to the right side of the heart. If the posture of the pregnant patient in labor due to the enlarged uterus interferes with the function of respiration, and the aspiratory function of the thorax is decreased, it means that less blood is being pumped into the right side of the heart. The heart rate therefore is increased and the volume of blood to the heart is decreased which causes an increased work or an extra strain on the heart. In the cardiopath the principle involved is to give the heart as little extra strain as possible, and I feel convinced that this mechanical factor is important and is one that we can control.

The problem of dilatation of the heart is one of cardiology. From a study of the physiology of cardiac failure in the cardiopath during labor, we know that the flow of blood to the heart is decreased, so that the chambers of the heart will decrease in size to accommodate themselves to the diminished volume, and at the same time there is an engorgement of the splanchnic blood. It has been stated that dilatation of the heart is a postmortem finding in all cases of cardiac death, that it is not the anemia of the heart, but an anemia of the coronary vessels that is the cause of shock and death in the cardiopath in labor or shortly after. It is necessary for obstetricians to change their terminology as to the mechanism of death in the cardiopath.

Dr. Horner advocates cesarean section. It is still an unsettled question. The problem is, what is the effect of a laparotomy on the heart, even in a low cervical

section? Henderson has called attention to the atony that occurs postoperatively which predisposes to surgical shock. In cesarean section the problem is to determine the amount of cardiac reserve. I have shown that it cannot be done with any degree of accuracy. Many cardiopaths develop cardiac failure during labor, and after the child is delivered. I do not believe that for the sake of sterilization cesarean section should be the choice in cardiopaths, as the sterilization at a later date gives the patient a better chance. I am a strong advocate of delivery per vaginam.

Dr. Galloway referred to the use of pituitrin. I believe that most cardiac deaths are due to gravity shock which means a splanchnic engorgement. The use of pituitrin helps to increase the blood pressure and increase the tone of the splanchnic vessels which will help to increase the flow of blood to the right side of the heart. It is a question whether there is enough histamine in one, two or even three ampules of pituitrin to get a histamine reaction.

DR. HARRY O. MARYAN presented a paper entitled *The Bacteriology and Pathology of Chronic Cervicitis*. (See page 555.)

DR. RICHARD TORPIN (by invitation) presented a paper entitled *Placenta Circumvallata and the Theory of Its Formation*. (See page 551.)

DISCUSSION

PROFESSOR GEORGE W. BARTELMEZ.—The question of placental growth is a problem that is worth extensive study. In the absence of adequate landmarks it has been impossible to evaluate the parts played respectively by growth and by the burrowing of the ovum into the mucous membrane at the margins of the placenta during the earlier months of pregnancy. At the middle of pregnancy the placenta occupies a relatively larger area of the uterus than at term. Dr. Torpin's theory regarding the mode of formation of the placenta circumvallata is similar to that of Grosser, but was reached independently. A detailed study of the placental margin in a large series of placentae in situ is clearly indicated.

DR. CAREY CULBERTSON.—There is no doubt that this formation represents an infarction and there is no doubt that some infarctions have been shown to be due to obliteration of the chorionic vessels secondary to some general toxemia.

The theory here presented is a mechanistic one, not based upon any pathology in the individual. It also brings out a new idea that infarction may originate in the intervillous circulation instead of in the chorionic vessels. As the gestation sac grows, the uterus accommodates itself to this growth and development. This requires an adjustment of relationship that ordinarily makes the normal placenta comparable to the demands of the normal gestation sac, the fetus and its contents. When this nicety of adjustment is lacking, we may have the conditions that Dr. Torpin has so painstakingly attempted to reproduce in his charts. We should not forget also that the character of the decidua depends upon the character of the mucosa. If this is defective, again we may have conditions such as described. The difficulty, of course, is in the proving. I suppose the best way to prove this or to attempt to prove it would be to have a large number of pregnant uteri for study.

DR. EMIL RIES.—Part of the work that Dr. Torpin mentioned was done under my guidance about forty years ago when I was an assistant at the Strassburg clinic. The question and recognition of the site of the placenta and the way the round ligaments are inserted into the uterus were investigated at that time. It was noticed that sometimes the round ligaments would be pulled in front of the uterus, at other times at the side running almost parallel in an almost vertical direction. In these

latter cases we assumed that the placenta was located in front and, therefore, had separated the points of insertion of the round ligaments. The basis of all this theorizing was that it was assumed that where the placenta grew, the uterus had to grow with it. We then proceeded to test this theory by manual exploration of the uterus after expulsion of the placenta. The theory proved about 95 per cent correct. There were still 5 per cent of the cases which for some reason or other we did not diagnose correctly. The practical value of such a method of diagnosing the site of the placenta on the uterus lay in the fact that at cesarean section, it is not desirable to cut through the placenta. At least, if a way could be found to diagnose the site of the placenta before operation, the operator could be prepared for disturbances at the site of the placenta. This investigation was carried out by Dr. Palm under the direction of Prof. Heinrich Bayer, the author of one of the best works on the pregnant uterus. Professor Bayer was very much interested in these investigations because they led up to some theories of his as to the origin of the circumvallata. His idea had been that there must have been some reason for the placenta to grow out at the edges instead of growing on the flat. He had investigated many cases of circumvallata by manual exploration after expulsion of the placenta and found them located in the uterine horns. Bayer had a theory that the uterine horn as much as the lower uterine segment undergoes invasion by the placenta if the placenta happens to be located in it. With the tubal segment being thinned, the blood supply of the placenta would suffer and, therefore, the placenta was forced to grow out. There would be a deep process of the placental tissue in the tubal segment, but this deep invasion would be insufficient to nourish the placenta. It is a question whether we always have to deal with deficient blood supply if there is insertion in an unfavorable position. That would have to be investigated by studying placenta previa. Placenta previa invading the lower segment would be acting as an annular placenta which at certain places would have a tendency to form circumvallata. The same would apply to tubal horn placenta.

DR. TORPIN (closing).—In regard to Dr. Ries' suggestion, I have made no such investigation because I have not the material. I speculated as to the cause of these bodies that normally grow on the anteroposterior wall. The marginalis occurs at the lateral angle of the uterus and the circumvallata in the horn, breaking the blood supply to the decidua all around, so the chorionic villi grew into the decidua well supplied with blood. On the lateral surface the chorionic villi would grow into anemic areas, whereas in an area like this they would grow into an area in the horn better supplied with or still containing blood.

BROOKLYN GYNECOLOGICAL SOCIETY.

STATED MEETING, MAY 1, 1931

DR. J. T. WALLACE (by invitation) presented a paper entitled **Dystocia Due to Contraction Rings of the Lower Uterine Segment**. (For original article see page 589.)

DISCUSSION

DR. ELIOT BISHOP.—I feel very strongly that this type of dystocia should be treated conservatively. Patience, free use of analgesia, rotation of the posterior position 180 degrees, breaking up of a breech, the two latter to be done at the proper time and with deep anesthesia, will produce, in most instances, a live baby and an unterrified and undamaged mother. I admit the occasional loss of a baby by this method. With a young primipara, I consider it the proper practice, but

with an elderly primipara, I feel that, with the lessening years of fertility, cesarean section is indicated in the interests of the so-called "overvaluable child."

DR. CAMERON DUNCAN.—Adrenalin will sometimes relax a contraction ring. I have had occasion to put on the forceps and not get any result and after a hypodermic of 15 minims of adrenalin the contraction ring would melt away and the baby would float out with the first pull. I believe it has some relaxing effect on contraction ring in the uterus. Chloroform anesthesia sometimes will cause relaxation of a contraction ring when ether will not.

DR. H. S. ACKEN presented a **Report of 535 Consecutive Cases of Mid and High Forceps.** (For original article see page 538.)

DISCUSSION

DR. H. W. MAYES.—The use of high forceps has often been condemned, and Beck binder, version or cesarean section recommended in its place. To my mind, these all have their place, but there are undoubtedly certain cases which could be delivered, even though the presenting part does not enter the pelvis, as is illustrated in the following case report.

Mrs. J. A., a white, Italian woman, aged twenty-six, was first delivered by me in 1924. She had a mitral stenosis, heart on the verge of decompensation. Her diagonal conjugate was $10\frac{1}{2}$ cm., with a true of $8\frac{1}{2}$ cm. She was in labor for thirty hours, the breech presenting, and it was finally necessary to deliver her by breech extraction. The baby was small, weighing only 6 pounds.

Patient was again delivered in 1925. At this time she was in labor for fifteen hours, and in order to hasten dilatation of the cervix, a bag induction was done. When the cervix was fully dilated, the head was only dipping in the brim and because of her cardiac condition, an attempt was made to deliver her by high forceps. This was unsuccessful. A version was done and the baby delivered with considerable difficulty. The baby weighed 8 pounds 14 ounces.

This patient was again admitted to the hospital in 1927 and after laboring for nine hours, dilatation was assisted by means of a Voorhees bag. The presenting part finally reached the mid pelvis in an L.O.A. position and delivery was completed with Barton forceps. The baby weighed 7 pounds 2 ounces.

In 1928, after the patient had been in labor for ten and one-half hours, the cervix was fully dilated, head in L.O.T., not engaged, posterior parietal presentation. By the use of a "broken" blade of a Barton forceps, pressure was made during a contraction and the head dropped to mid pelvis. Delivery was easily completed with a Simpson forceps. The baby weighed 8 pounds 11 ounces.

In 1930, after this patient had been in labor for nine and one-half hours, the head was not engaged. An unsuccessful attempt was made to deliver by means of Barton forceps. Delivery was finally completed with a brow-mastoid application of a Tarnier axis-traction forceps. The baby weighed 8 pounds 2 ounces.

Thus, a woman with a mitral stenosis, a heart barely compensating, has been delivered by me five times in the last six years, with an average duration of labor of fifteen hours, and only once did the presenting part engage; the first a breech, the second a forceps followed by a version, the third a mid forceps, and the last two, high forceps. All babies were born alive and left the hospital in good condition. The questions may be asked: Should she have been sectioned or should she have been given a longer test of labor? I believe, with her cardiac condition and each time knowing what had happened at the previous delivery, that interference was justified in each instance. When we have a borderline pelvis, with a heart badly damaged, the use of high forceps may be the means of helping both the mother and child. High forceps does not necessarily mean the use of Tarnier axis-traction

forceps, with the handles locked like a cranioclast, for frequently the high arrest may be due to a malposition. When this is overcome, the delivery is easy. I have used Barton forceps with great satisfaction, sometimes only the broken blade to force the head into the mid pelvis. If delivery is not easily accomplished with this instrument, frequently a manual rotation may be used before the application of another forceps.

In certain patients with normal measurements and a normal size child, the rapid completion of delivery may be indicated because of the condition of the child or its mother. Then again there are undoubtedly a large number of cases which are delivered by cesarean section simply because of the danger of infection. There are those who even hesitate to do a vaginal examination in order to determine the actual condition. With proper vaginal antisepsis and a routine instillation of mercurochrome during labor, we have proved that a test of labor does little to increase the morbidity following cesarean section and I am convinced that a large number of these women could be anesthetized and delivery attempted from below by means of forceps and if a disproportion is found, then cesarean section could be performed with little risk of infection.

Correspondence

The Effect of Urinary Preservative on the Accuracy of the Aschheim-Zondek Test

TO THE EDITOR.

SIR:—Since the introduction of the Aschheim-Zondek test, many reports have appeared in the literature acclaiming its diagnostic accuracy. Freshly voided or catheterized urine is used in performing the test. This procedure can easily be carried out in the larger cities or where there is immediate access to a laboratory equipped to perform the test. I have made an investigation to determine whether the test could be performed and accurate results obtained with a sample of urine voided several days prior to its use. A number of tests were done using urine which had been left standing at room temperature for several days, with and without the addition of a preservative. The preservative where used was added immediately on obtaining the specimen of urine. In all, twelve examinations were made on nine patients. Seven of these patients were definitely pregnant. Seven examinations were made with urine containing toluene as a preservative and left standing at room temperature for a period varying from three to seven days before being used. Six of these were positive. One specimen in a patient with an amenorrhea of seven weeks, and presumably pregnant, was negative. Two examinations were made with urine which had been standing on ice for several days before use. Both of these examinations were positive. Three examinations were made with urine standing at room temperature for one week before use. In these cases all the mice died.

While it is true that from so few observations one is unable to draw any final conclusion, yet the uniformity of the positive Aschheim-Zondek test results using urine containing a preservative, points to the feasibility of securing accurate results when performing the test. This fact will be of distinct benefit to physicians in communities where facilities for doing the test are not available. It will enable them to send specimens to distant laboratories, with the assurance of receiving accurate reports.

The addition of preservative also might be useful in collecting sufficient urine so that the anterior pituitary hormone could be extracted therefrom commercially.

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CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Selected Abstracts

Physiology of Pregnancy

Tullio: The Urinary P_H in Pregnancy and the Puerperium. *Osp. maggiore di Novara* 8: 756, 1930.

In a study of the urine of 80 cases of normal pregnancy and 50 cases of normal puerperium, the following results were obtained:

In pregnancy the P_H is 6.4, in the puerperium it is 6.2. Controls (not menstruating) show a P_H of 5.7, and controls (menstruating), of 6.45.

It is evident from these cases that during pregnancy there is a slight diminution of the hydrogen concentration of the urine. This might lead one to think that the kidney, an important organ in the acid-base equilibrium, might be slightly altered in function. This together with other factors, such as excretion of phosphates and NH_3 , may vary the urinary P_H .

Diminished urinary acidity might be the result of pulmonary superventilation in pregnancy.

SYDNEY S. SCHOCHET.

JULIUS E. LACKNER.

Adler, M.: Calcium Content of the Blood Serum During Pregnancy. *Arch. f. Gynäk.* 143: 236, 1930.

The author studied the calcium content of the blood serum in 14 nonpregnant and 26 healthy pregnant women, in 5 women during labor, and in 12 puerperae. The Kramer-Tisdall technic was used. She found that the quantity of calcium in the serum begins to decrease during the third month of pregnancy and that from the fifth to the ninth month this decrease is both uniform and constant. During the tenth month there is a slight increase over the amount present in the ninth month. This amount, however, is still far below that found in the nonpregnant state. During labor the calcium content increases rapidly until it is well within the limits of normal physiologic variability. Within twenty-four to forty-eight hours postpartum the calcium content drops to less than was present before the onset of labor. It remains subnormal for approximately eight days, and then gradually returns to within normal limits.

RALPH A. REIS.

Cantarow, Montgomery and Bolton: The Calcium Partitioning in Pregnancy, Parturition and the Toxemias. *Surg. Gynec. Obst.* 51: 469, 1930.

This paper offers first a brief survey of the studies of calcium metabolism in pregnancy to be found in literature, secondly, a consideration of present-day views of biologists as to the chemical nature and physiologic importance of calcium in the human economy; and thirdly, a presentation of findings in a group of pregnant and parturient women, based upon these more recent biologic concepts. During the course of normal pregnancy and early labor there is a gradual diminution of total

serum calcium, a slight increase in diffusible calcium and a marked decrease in nondiffusible calcium. The ratio of diffusible to nondiffusible calcium increases steadily, reaching a maximum in the first stage of labor. This disturbance is identical with that present in bronchial asthma and allied disorders.

The toxemias of pregnancy are characterized by a marked decrease in the ratio of diffusible to nondiffusible calcium, due in most instances to an increase in the nondiffusible fraction. This finding suggests the presence of a state of diminished cell permeability, a condition which might well be associated with the marked disturbance of function that occurs in various organs in the toxemias of pregnancy.

WM. C. HENSKE.

Damble, K.: Calcium Content, Leucocytes, and Blood Coagulation in Pregnancy, Postpartum and Puerperium. Arch. f. Gynäk. 140: 313, 1930.

The normal calcium content of the blood was found to be 9.97 mg. per 100 c.c. During the second half of pregnancy this decreases to 9.36 mg. Two hours postpartum the calcium content has risen to 9.75 mg.; there is then a gradual return to the normal during the puerperium, the average reading on the fifth day being 9.82 mg. The average leucocyte count during the second half of pregnancy was 6,955 in normal healthy women, the highest normal reading being 9,822. The leucocyte counts two hours postpartum ranged from 9120 to 22,700; following this there was a gradual decrease until the fifth day when the average count was 7702. The differential count shows a shift to the left during the second half of pregnancy, with an increase of neutrophiles, nucleated erythrocytes and immature red blood cells and a decrease in lymphocytes and eosinophiles. Two hours after delivery the swing to the left is more marked as evidenced by marked increase in nucleated red blood cells and in immature red cells and a decrease in all other types of cells. By the fifth day, provided the puerperium is normal and afebrile, the differential count has returned to normal. Studies of the coagulation time in normal women showed values of five minutes for beginning of coagulation and eight minutes for the completion of coagulation. During the second half of pregnancy, the coagulation time rate increases, the rate being four and seven minutes. This increased speed of coagulation is still found two hours postpartum and on the fifth day postpartum, the rate has returned to normal. The author could establish no definite relationship between calcium content and coagulation time, calcium content and leucocyte count, or coagulation and leucocyte count.

RALPH A. REIS.

Krane, W.: Interchange of Potassium and Calcium Between Mother and Fetus. Ztschr. f. Geburtsh. u. Gynäk. 97: 22, 1930.

Kraue studied the potassium and calcium content of the blood of 17 women and their children (immediately after delivery). His conclusions are: (1) The placenta does not play an active part in the passage of these salts from mother to fetus.

(2) The differences found between the concentration of potassium and calcium in the maternal and fetal sera can be explained on purely physiochemic processes.

LESTER E. FRANKENTHAL, JR.

Rupp, Hans: Sodium Chloride Metabolism During Pregnancy. Ztschr. f. Geburtsh. u. Gynäk. 95: 383, 1929.

The author examined the sodium chloride metabolism in normal healthy women, in normal pregnant women, in pregnant women during the development of edema, and in pregnant women during the subsidence of the edema. Determination of the blood and urine sodium chloride were made to see how long the salt remained in the

body after its ingestion. Comparing the curve of the blood sodium chloride with the table of the urinary secretion of this salt, the following was observed: (1) the blood sodium chloride in healthy pregnant women was increased; (2) in edematous pregnant woman the sodium chloride passes directly from the blood to the tissues and is held there; (3) during the subsidence of the edema the reverse is true. On these observations, Rupp feels that a limitation of the sodium chloride intake is the essential thing, and that limitation of fluids is not important.

LESTER E. FRANKENTHAL, JR.

Breda, Leo: Studies on Hyperbilirubinemia in Normal Pregnant Serum. *Ztschr. f. Geburtsh. u. Gynäk.* 95: 394, 1929.

The normal bilirubin content of the blood of nonpregnant women is 0.2 to 0.3 mg. per 100 c.c., and in men 0.45 to 0.55 mg. per 100 c.c. In a study of the blood of 58 pregnant women the author found that 45 per cent of the pregnant women and 20 per cent of the puerperal women (first eight days) showed an increase of bilirubin content of the blood of over 0.3 mg. per 100 c.c. These women all had negative direct van de Berger reactions. Breda feels that the hyperbilirubinemia during pregnancy is due to an altering of the bilirubinogenic apparatus, the reticulo-endothelial system, and the liver cells. These findings do not justify the term "liver of pregnancy."

LESTER E. FRANKENTHAL, JR.

Vogt, E.: Reform of the Diet in Pregnancy, With Special Consideration of the Vitamin Requirements of the Fetus. *München. med. Wchnschr.* 76: 1959, 1929.

Vogt cites various experiments to show the importance of the different vitamins to the growing fetus. He makes a special effort to meet these needs in the diet suggested for pregnant women. Emphasis is laid upon large amounts of green vegetables, fruit, eggs, milk, and milk products. In addition, cod liver oil, yeast, and vigantol (viosterol) are given in moderate dosage during the latter half of pregnancy. They are not usually given during the first half of pregnancy because of the gastric symptoms commonly encountered at this time. In addition to these vitamin-bearing substances, some form of calcium is usually administered. The author feels that habitual abortion or premature labor, habitual death of the fetus at term, and the manifestations of eclampsia are all indications for the inclusion of large amounts of vitamins A, B, C, and D in the pregnancy diet.

A. SHULMAN.

Nahmmacher, H. How Does Standardized Vitamin D (Vigantol) Administered to the Pregnant Woman Influence the Development of the Fetal Organism and the Pregnancy? *Zentralbl. f. Gynäk.* 54: 1820, 1930.

In order to determine the effect of a standard vitamin D, the trade preparation Vigantol was used. Observations were made on 45 pregnant women who worked in the hospital while waiting for confinement; 79 similar cases were taken from the records of the years 1926-28 as controls. The observations were as follows: (1) Increased drop in initial weight loss of the newborn (due to increased metabolism?); (2) physiologic initial weight loss is further influenced as follows; (a) uninfluenced by 80 mg. of vigantol, (b) markedly increased by 300 clinical units. (3) A slight increase in birth weight in only a very few cases. (4) A tendency to lengthening of the pregnancy, average being ten days. (5) The addition of cod liver oil to the diet during pregnancy not only prevents habitual antepartum death of the fetus, but greatly aids intrauterine development.

WILLIAM F. MENGERT.

Temesvary, N.: Diseases of the Teeth and Pregnancy. *Monatschr. f. Geburtsh. u. Gynäk.* 87: 527, 1931.

Afflictions of the teeth which affect pregnant women are gingivitis, especially *gingivitis hypertrophica*, caries, toothache, epulis, loosening of the teeth and periostitis. Etiologic factors are improper nourishment, digestive disturbances, frequent vomiting, with acidification of the saliva, lack of care of the mouth and teeth and changes in the calcium metabolism and of other salts. In many cases, the cause is a disturbance in the balance of the glands of internal secretion. Toothaches and changes in the calcium structure of the teeth are almost certainly due to hormonal influences. Changes in the teeth usually appear in the fourth month of gestation and continue until six or eight weeks after delivery. Prophylaxis consists of proper care of the teeth and mouth during pregnancy. The teeth should be examined every two or three months during pregnancy. Treatment of the teeth may safely be undertaken in a pregnant woman because no harm has ever been observed. It is wise however, to avoid energetic manipulation four, eight, and twelve weeks after the last menses because of the greater tendency to abortion in the first three months of pregnancy.

The author mentions that as an important prophylactic measure against puerperal infection the teeth not only of the pregnant women should be carefully controlled but also teeth and mouths of all persons who take care of the patients.

J. P. GREENHILL.

Item

The American Board of Obstetrics and Gynecology

The general examination of the American Board of Obstetrics and Gynecology will be held Tuesday, May 10, 1932, at New Orleans.—Secretary, Dr. Paul Titus, 1015 Highland Building, Pittsburgh, Pa.

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Original Communications

THE PASSAGE OF SPERMS AND EGGS THROUGH THE OVIDUCTS OF THE RABBIT AND OF THE HUMAN BEING WITH A CONSIDERATION OF SAMPSON'S THEORY OF HEMORRHAGIC OR CHOCOLATE CYSTS

BY G. H. PARKER, CAMBRIDGE, MASS.

(From the Zoölogical Laboratory of Harvard University)

1. INTRODUCTION

THE passage of sperms and eggs through the oviducts of mammals and especially of human beings has been a matter of long-standing controversy and has raised the general question of how materials are transported through these ducts. For several years past I have been working on this question with special reference to the rabbit, and I have discovered conditions in this mammal that have important bearings on sperm and egg transportation in the human being. An extended paper dealing with this problem in the higher vertebrates is in process of publication in the Philosophical Transactions of the Royal Society of London and the present contribution is a brief statement of that part of the longer paper which deals with human beings and other mammals. For additional information on the general topic the reader is referred to the longer paper.

2. ASCENT OF SPERMS

In copulation the male rabbit deposits the sperms at the inmost end of the vagina. The rabbit uterus is bipartite and under normal conditions the sperms make their way from the vagina into each uterus in a very short time. Living sperms have been identified in the lower end of the rabbit uterus one minute and fifty seconds after copulation. The maximum distance through which these sperms had passed up the uterus was thirteen millimeters. As rabbit sperms swim about 0.05 of a millimeter a second, it would have required them over four minutes to have

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covered this distance under their own locomotion and this computation is on the assumption that the sperms swam continuously straight ahead. The only explanation of their arrival at this point in a minute and fifty seconds appears to be the muscular activity of the region concerned. This activity is the motor aspect of the female sexual orgasm and was long ago pointed out by Beek (1875) as the probable means in human beings of the transfer of sperms from the vagina to the uterus. In such small mammals as the rat, judging from the observations of Hartman and Ball (1930), this muscular action may carry sperms to the apex of the uterine horn in less than two minutes, a condition probably not to be found in the larger forms. It is also likely that in rabbits and in human beings sperms make their way from the vagina into the uterus through their own locomotion but this form of transfer, already described by Walton (1930) for the rabbit, is scarcely to be regarded as normal. At least, it does not appear to represent a step in which the female reproductive apparatus can be said to be functioning at full efficiency.

The uterus of the rabbit, like that of the woman, is very slightly ciliated. If living sperms are injected into the top of a fresh uterus from a rabbit, they will find their way to the bottom of this organ in about two hours. If they are injected into the bottom they will reach the top in about the same time. In this respect the tube appears to be unpolarized and their passage through it seems to depend entirely upon their own locomotion. This is consistent with the observations of Lim and Chao (1926, 1927), who, by surgical operation, reversed a segment of a rabbit uterus without, however, reducing pregnancy. What has been demonstrated for the uterus in the rabbit may well apply to that in woman.

In most mammals, including human beings, a narrow uterine tube leads from the deep end of the uterus by a somewhat circuitous course to the immediate vicinity of the ovary where it opens by an expanded infundibulum. This tube is completely ciliated in both human beings and the rabbit and the cilia beat uniformly toward the uterus. Some of the older investigators believed that the sperms were carried through this tube by antiperistalsis. In all my experiences with living rabbit tubes I have never noticed evidence of antiperistalsis. Modern students are almost universally of the opinion that the sperms swim through the tube against the ciliary current as fishes swim upstream against the current of water. This opinion was expressed by Lott as early as 1872 and by many later workers, especially Adolphi (1905, 1906). The experimental basis upon which it rests consists in observations on sperms contained in a very shallow layer of fluid between a cover-glass and glass slide. When a slight current is generated in such a fluid the sperms are seen swimming against it. This is due to the fact that their heads are somewhat sticky and adhere slightly to the glass with which they are in contact; as a result of the current they swing round on their heads as a weather vane

about its point of attachment; thus their tails come to point downstream and when they swim they move upstream as a result of their orientation. Their direction is thus the outcome of a preceeding and somewhat mechanical orientation. It was this evidence that led investigators to accept the view that sperms swim against the current in the oviducts; that is, that they are rheotactic. But sperms in the oviducts of mammals, including human beings, are not in contact with such surfaces as those used in the experiment just described. They are in the majority of cases suspended in fluid and only rarely in contact with the sides of the duct. If a preparation of the wall of the duct is made in fluid rich in living sperms and the whole is inspected under a microscope, the sperms will be seen to be swept with great velocity in the direction of the ciliary cur-

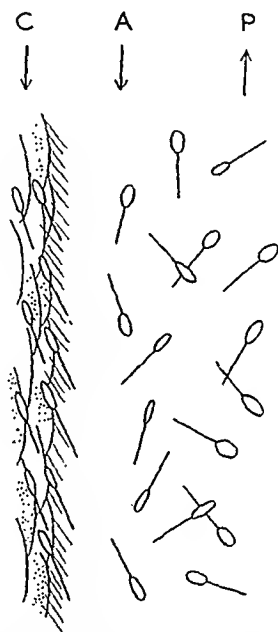


Fig. 1.—Free-hand sketch of the edge of a fold from the uterine tube of a rabbit showing the distribution of living sperms on the fold and in the adjacent fluid. A, ciliary current toward the uterus; C, ciliated epithelium on uterine fold; P, counter-current away from the uterus.

rent (Fig. 1). Their own locomotion plays almost no part in their distribution, for they are rushed indiscriminately down the duct by the ciliary action. Those that touch the sides of the duct often adhere there and remain fixed at the point of attachment. The condition of this test reproduces much more accurately the state of sperms in the oviduct than does that with cover-glass and slide, and it leads to the conclusion that the swimming of sperms against the current or sperm rheotaxis is not a significant element in the transfer of these cells. In other words, sperm rheotaxis is probably in large part a laboratory artefact rather than an actual occurrence in the oviducts.

If sperms are carried down the uterine tubes by the ciliary currents, how do they ever reach the upper ovarian end where the eggs are known

to be fertilized? In the rabbit the passage of the sperms through the uterine tubes requires about two hours. How this transfer can be accomplished may be discovered from experimental procedure. A tube from a freshly killed rabbit may be suspended with its fat and other adjacent parts in warm Ringer's solution and kept locally alive for some hours. If now a small amount of India ink in Ringer's solution is injected into the cavity of such a tube midway its length and the preparation is allowed to stand for an hour or more, the ink will be found to have approached both ends of the tube or even escaped from them. Ink discharged into the tube near its uterine end eventually makes it way out at the infundibulum and, similarly, ink injected into the infundibulum finally escapes into the uterus. These experimental results show conclusively that the tube is so constructed that materials like ink may pass either way throughout its length. If a freshly prepared tube is watched closely from the outside, no evidence of peristalsis or antiperistalsis will be seen. The muscular movements of the tube are slight and almost exactly like those of segmentation as seen in the vertebrate intestine; the tube constricts at one point and then relaxes, during which time a new constriction is established above and below the old one. These movements are not direct means of transporting materials through the tube; they serve merely to open and close it locally.

If the structure of the interior of the tube is now considered in relation to these movements, an obvious means of transporting the sperms will be seen. The uterine tube in the rabbit and in the human being is not a simple open duct but, as is well known, its cavity is partly divided by numerous folds which project from its outer wall irregularly into its interior (Fig. 3). The faces of these folds and the inner face of the wall of the tube are richly ciliated and all the cilia, as already noted, beat toward the uterus. When muscular constrictions occur at intervals along the length of the tube, as in segmentation, the spaces between the folds and any two such constrictions are temporarily cut off from communication with the corresponding spaces above and below. These spaces are in the form of elongated compartments with ciliated walls. Each compartment is filled with fluid and that portion of the fluid which is next the walls of the cavity moves under ciliary action downward toward the uterus. When it reaches the lower end of the compartment, since it is unable to escape because of the constriction, it turns and passes up the center of the compartment to the top whence it returns again over the side walls to repeat its course. In this way each compartment exhibits within itself a circulation which will carry sperms not only downward but also upward and thus in a very short time distribute them throughout the whole length of the compartment (Fig. 2). In transverse section (Fig. 3) such a compartment would exhibit a layer of fluid next its wall and moving downward and a column of fluid in its axis and moving upward. The two moving masses of fluid would be

separated by a thin layer of dead water. When a set of constrictions vanishes by relaxation and new sets appear at new points on the length of the tube, the region of the old compartments is divided in such a way that some of the contents form parts of new lower compartments and some of new upper compartments. Sperms that find themselves in the new upper compartments are thus advanced toward the ovary, while those below are turned back. By this process of continued dissolution

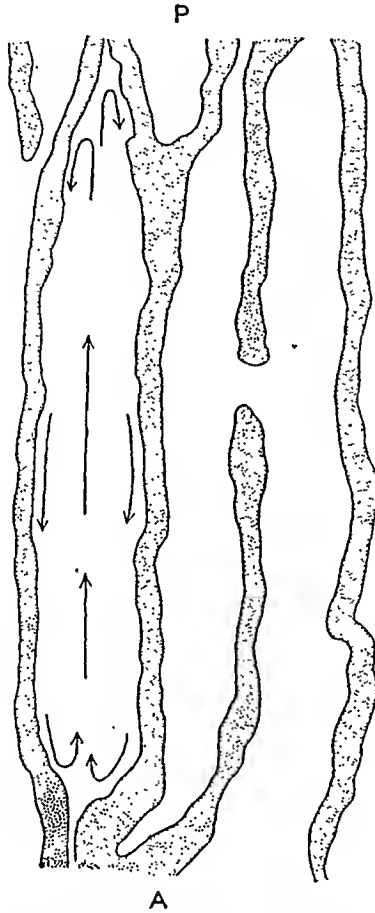


Fig. 2.—Diagram of a longitudinal section from the uterine tube of a rabbit. Three compartments are shown, in one of which the circulation is indicated by arrows; the currents toward the uterus are next the ciliated walls and the opposing current is in the axis of the compartment. A, toward the uterus; P, away from the uterus.

and formation of compartments sperms may gradually be transferred from one end of the duct to the other. The process, somewhat haphazard in nature, necessarily reduces the number of sperms as the tube is ascended. Nevertheless, the operation is one which in the end will transfer the sperms throughout the length of the duct. It is by this means that sperms and any other small particles, such as ink grains, are transported either up or down the tube. The operation is in no wise dependent upon the motility of the particles. Immobile granules of ink are transported as freely as swimming sperms. The length of the uterine

tube in the rabbit, about eight centimeters, is known to be ascended by sperms in approximately two hours. This time is also, roughly, the period required for the passage of ink through the tube. Hence, the time relations here are appropriate for the type of transportation assumed. This compartment system therefore affords an effective means for the last step in the transportation of sperms whereby they reach the region of the infundibulum where fertilization takes place.

The conditions observed in rabbits justify the opinion that in other mammals, including human beings, sperms are transferred from the vagina to the uterus usually through the muscular activities of the parts concerned and less usually by the locomotion of the sperms themselves. The sperms pass through the uterus under their own locomotion. The passage through the uterine tubes is not a result of sperm rheotaxis but is dependent upon the compartment system characteristic of these ducts.

3. THE DESCENT OF THE EGGS

The rabbit is remarkable in that its eggs are shed from the ovary approximately ten hours after intercourse with the male. In this respect it is unlike most mammals in which, as is well known, the eggs are discharged in relation to the physiologic rhythm of the female. Shortly after the eggs leave the ovary of the rabbit they accumulate in the infundibulum and then make their way in the course of three to four days through the length of the uterine tube. As the eggs are devoid of means of locomotion, they must pass through the tube as a result of the activity of its walls. These are muscular and ciliated. Some authors have maintained that the effective elements in this transfer are ciliary, others that they are muscular, and still others that both elements are concerned with transportation. About a decade and a half ago a somewhat heated discussion on this subject took place between Sobotta and Grosser. Grosser (1915, 1918) maintained that the tubal cilia were the exclusive means of transporting the eggs. This opinion was opposed by Sobotta (1914, 1915, 1916) who declared in favor of muscular action. Sobotta pointed out that cilia were absent from the lower part of the tubes in mice and rats and that consequently in such a region the only means of transportation was muscular. This view has now been rather generally accepted.

Though it must be admitted that under certain conditions muscles are the only means of transportation for the egg, it does not follow that cilia may not also at times have a part in this operation. It has been maintained by some workers, such as Heil (1893), Hofmeier (1893), and von Mikulicz-Radecki (1926), that the tubal cilia are too weak to move the mammal egg. But it is doubtful whether the evidence adduced by these workers is conclusive. They have attempted to test this question by placing the eggs on the ciliated surfaces of open tubes. Such a condition is very unfavorable as a test of the mechanical efficiency of cilia. They are thus placed in a position where they are least effective. In a closed

tube they can act upon objects the size of the egg much more successfully. The rabbit egg is a sphere with a diameter of approximately 0.12 mm. When an egg of this size is compared with the actual spaces in the uterine tube (Fig. 3), it will be seen that the egg is of such a size that in all cases it would press against the ciliated walls. Such a condition is most favorable for the ciliary transportation of a body like the egg, and since it is known not only that rabbit eggs will pass through the tubes normally, but that similarly sized eggs of nematodes (Lode, 1894) will, under experimental conditions, also make the passage of the tubes, it seems likely, considering the sizes of these objects in relation to the ciliated spaces in the tube, that cilia play a not inconsiderable part in this transfer.

The special transporting actions of the uterine tubes are determined, as the preceding discussion shows, by the size of the bodies concerned. Small particles, such as ink granules or sperms, are transported either

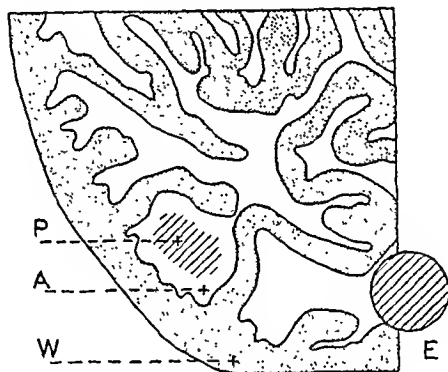


Fig. 3.—Diagram of a quadrant of a transverse section from the uterine tube of a rabbit. A, ciliary current on the periphery of a compartment and toward the uterus; E, outline of egg drawn to the same scale as that of the tube; P, counter-current in the middle of a compartment and away from the uterus; W, wall of the uterine tube.

up or down the tubes. Large particles of the size of the mammalian egg are carried down the tubes only. This difference seems to be characteristic of these bodies and depends upon their relative sizes, and the statement embodying this view may be set down as the law of the tube. Certainly the structural organization of the tube as well as the experimental evidence brought forward favor this interpretation and make clear the remarkable property of the tube; namely, the capacity to transport objects of appropriate size toward the ovary or away from the ovary even at the same moment.

4. SAMPSON'S THEORY OF HEMORRHAGIC OR CHOCOLATE CYSTS

It is well known that the region of the ovary in mature women may be the seat of the formation of cysts of a brownish color and of an unusual character. These cysts exhibit menstrual activities corresponding in time and general character with the menstruation of the person concerned. The blood discharged into their cavities is retained there, be-

comes brown in color, and thus gives to the cyst the special characters from which it gets its name. One of the remarkable features of the cyst is that it is lined with an epithelium most strikingly like that of the human uterus. In consequence of these peculiarities Sampson (1921, 1922) was led to advance the hypothesis that the cysts are growths from live epithelial cells liberated at menstruation from the inner face of the uterus and transported by some means unknown through the uterine tubes to be discharged in the vicinity of the ovary. This view of the formation of chocolate cysts has been supported by more or less experimental evidence (Jacobson, 1922), but it has never been made clear how immotile epithelial cells could make their way from the uterus to the ovary against the ciliary current of the tube. If, however, the compartment hypothesis described in this paper is a true statement of the way in which the tubes act, then this hypothesis offers a satisfactory explanation of the method by which freed epithelial cells from the uterus could be transported to the neighborhood of the ovary, for, since such cells are relatively small, they could be carried by the currents of the compartment system, as the sperms are, to the region of the ovary where they could attach themselves and grow as a transplant into a cyst. In this way the compartment hypothesis of the action of the uterine tubes affords not only an explanation of the transportation of sperms but also of that of the cells from which hemorrhagic or chocolate cysts may grow.

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MATERNAL MORTALITY AND THE MERCUROCHROME TECHNIC

AN ANALYSIS OF THE DEATHS FOLLOWING 15,647 DELIVERIES AT THE
METHODIST EPISCOPAL HOSPITAL, BROOKLYN, N. Y., 10,000 OF WHICH
FOLLOWED THE USE OF MERCUROCHROME AS A VAGINAL ANTISEPTIC

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IN THE United States registration area for 1929, the maternal death rate was 7 per 1,000 live births. Of this 42.8 per cent was due to puerperal sepsis.

For the five cities having a population of over 1,000,000 the percentage of maternal deaths due to puerperal septicemia is as follows: New York 34.6, Philadelphia 37.8, Chicago 41.5, Detroit 49.3, and Los Angeles 51.6. Ronsheim in a review of the mortality at the Jewish Hospital in Brooklyn, showed that 40 per cent of their maternal deaths was due to sepsis.

Thus, puerperal sepsis accounts for from 34 to 50 per cent of all maternal deaths. This percentage may be far too low when we consider that there is undoubtedly some inaccuracy in these reports, due to the fact that many patients who have puerperal sepsis with a toxemia or terminal pneumonia could easily be classified by the attending physician as dying from these conditions, while the cause of death was puerperal sepsis. Then again, when there is any doubt in the mind of the attending physician as to the presence of puerperal sepsis, he will often sign the death certificate giving some other reason for the actual cause of death.

TABLE I. MATERNAL DEATHS, METHODIST EPISCOPAL HOSPITAL

	1919-1924	1925-1927	1928-1930	TOTAL
Total deliveries	5115	5253	5279	15647
Total deaths	54	32	22	108
Cesarean sections	265	177	177	619
Cesarean section deaths	19	4	5	28
Deliveries less cesarean sections	4974	5076	5102	15154
Deaths less cesarean sections	35	28	17	80
Viable vaginal delivery deaths	28	17	7	52
Died undelivered or delivered before admission	4	6	2	12
Premature deaths				
From 3 to 7 months	3	3	7	13
Under 3 months	0	2	1	3
Died within 24 hours	16	9	4	29

In the following report, I have endeavored to analyze the maternal deaths following 15,647 deliveries at the Methodist Episcopal Hospital, the deaths from puerperal sepsis having been analyzed in detail.

From 1919 to 1924 inclusive, as is shown in Table I, before the use of mercurochrome, there were 5115 cases with 54 maternal deaths. Nineteen of these followed cesarean sections, leaving 35 deaths from vaginal deliveries and of these, 28 were in patients over 7 months pregnant. This may be compared with 5253 deliveries during the development stage

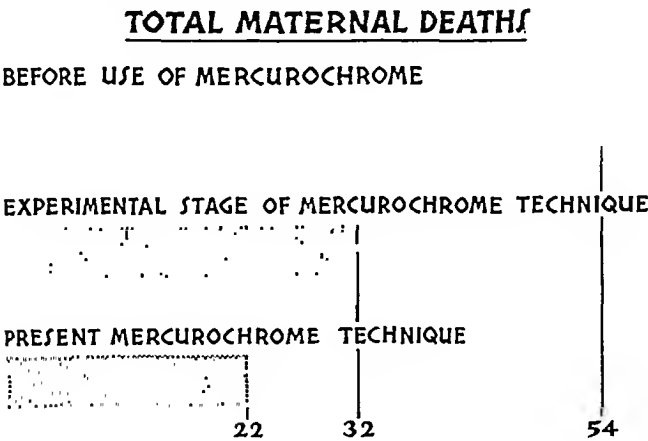


Fig. 1.

of the mercurochrome technic when there were 32 maternal deaths, 4 of which followed cesarean sections and 17 followed the vaginal delivery of a viable child. With the latest mercurochrome technic there were 5279 deliveries with only 22 maternal deaths, 5 of these following cesarean sections and 7 following viable vaginal deliveries.

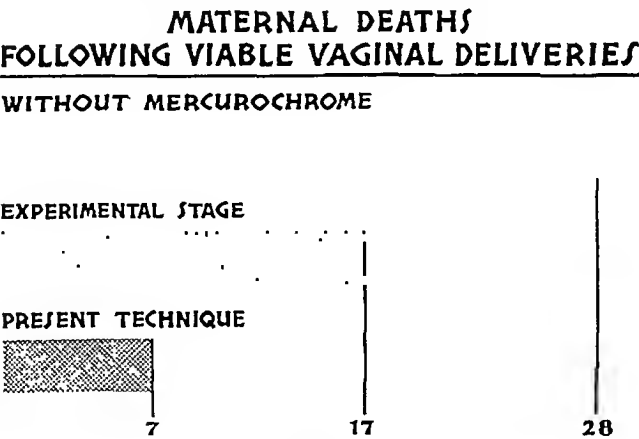


Fig. 2.

A comparison of these three periods is very striking and the marked decrease in the maternal deaths can be attributed partly to the fact that we have discarded the use of cesarean section in eclampsia, partly perhaps to the fact that we do better obstetrics, but the most striking factor is the reduction in the deaths from puerperal sepsis. Thus, from Table II it will be seen that there were 16 deaths from sepsis in the first period, 10 in the second, and only 3 in the last; one a full-term normal delivery,

one a cesarean section, and the third a five and one-half months' miscarriage.

There were 10 deaths from shock and hemorrhage before the use of mercurochrome, 3 during the experimental stage, and only 3 during the last 5,000 deliveries. Eclampsia and toxemia accounted for 14 in the first series, 3 in the second, and 4 in the last. Patients with toxemia and eclampsia have a lowered resistance following delivery, and they are very susceptible to infection. This is borne out by the fact that during the

TABLE II. CAUSE OF DEATH

	1919-24	1925-27	1928-30	TOTAL
<i>Viable Vaginal Deliveries—51</i>				
Sepsis	6	8	1	15
Shock and hemorrhage	8	2	2	12
Cardiac	2	1	0	3
Acute yellow atrophy of liver	1	0	0	1
Appendicitis	0	1	0	1
Eclampsia	3	0	0	3
Embolism	1	1	2	4
Inverted uterus	0	2	0	2
Placenta previa	1	1	0	2
Pneumonia	2	1	1	4
Psychosis	0	0	1	1
Pulmonary tuberculosis	1	0	0	1
Ruptured uterus	1	0	0	1
Toxemia	1	0	0	1
<i>Cesarean Section Deaths—27</i>				
Sepsis	7	1	1	9
Shock and hemorrhage	2	0	0	2
Cardiac	2	1	2	5
Cerebral hemorrhage	0	0	1	1
Eclampsia	4	1	0	5
Embolism	0	1	0	1
Thrombophlebitis	0	0	1	1
Toxemia	3	0	0	3
<i>Delivered Before Admission and Not Delivered—12</i>				
Sepsis	1	0	0	1
Shock and hemorrhage	0	1	0	1
Cardiac	0	1	0	1
Acute yellow atrophy of liver	0	1	0	1
Eclampsia	3	2	1	6
Hyperemesis gravidarum	0	0	1	1
Salvarsan (?)	0	1	0	1
<i>Under Three Months—3</i>				
Encephalitis	0	1	0	1
Hyperemesis gravidarum	0	1	1	2
<i>Between Three and Seven Months—14</i>				
Sepsis	2	0	1	3
Shock and hemorrhage	0	0	1	1
Cardiac	1	1	0	2
Acute yellow atrophy of liver	0	1	0	1
Eclampsia	0	0	1	1
Embolism	0	0	1	1
Hyperemesis gravidarum	1	0	0	1
Placenta previa	0	1	0	1
Pyelitis	0	0	1	1
Toxemia	0	0	2	2

period from 1919 to 1924, inclusive, there were 4 additional deaths from puerperal sepsis in which there was either a toxemia or an eclampsia, making a total of 18 deaths in which this condition played a part. While following the use of mereurochrome, toxemia and eclampsia were not a contributing factor in the septic deaths.

MATERNAL DEATHS FROM PUERPERAL SEPSIS

On the Obstetrical Service of the Methodist Episcopal Hospital, there were 108 maternal deaths during the last eleven years, 29 of which were due to puerperal sepsis; 4 of these patients were either not delivered or delivered before the period of viability. This leaves a death rate from puerperal sepsis of 22 per cent, while during the last three years there has been but one death from sepsis following the vaginal delivery of a viable child.

MATERNAL DEATHS FROM PUERPERAL SEPTICEMIA WITHOUT MERCUROCHROME

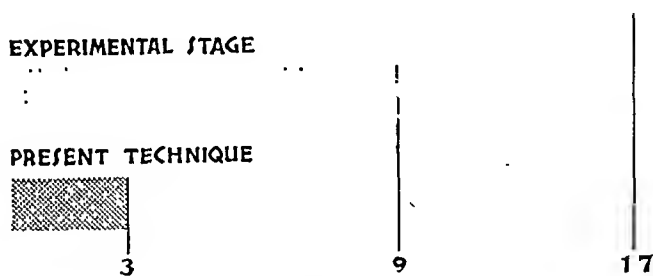


Fig. 3.

A. BEFORE THE USE OF MERCUROCHROME

An analysis of the deaths from infection before the use of mereurochrome, shows that 6 deaths followed the vaginal delivery of a viable child. All these patients were multiparae, ranging in age from twenty-seven to forty-one, with an average morbidity of seventeen days each. Only 3 had vaginal examinations, but 5 of the 6 had a period of dry labor averaging twenty-two hours each. This was undoubtedly one of the most important factors in the development of the sepsis. If the majority of the bacteria had been killed in the vagina at the onset of labor and by the use of regular instillations, so that the entrance of extraneous infection could be avoided, I believe nearly all of these women could have been saved. The average duration of labor was thirteen hours. The upper part of the vagina may be sterile at the onset of labor, but the advance and regression of the presenting part, undoubtedly plays some part in bringing the bacteria from the introitus and lower vagina up to the cervix and into the uterine cavity, as demonstrated by Bessessen and Bessessen. Three of the deliveries were operative. In 2 patients, the temperature developed

on the day of delivery and 1 each on the third, fourth, fifth, and eighth day. The blood cultures were positive in 3, negative in 2, and in 1 it was not taken. The average life of the patient following delivery was 12 days.

Without the use of mercurochrome there were 7 septic deaths in 265 cesarean sections, or one in 37.8. The average age of the patients was 34.9 years. Five were primiparae, 2 multiparae. Two had no examinations, 3 only rectal, and 2 vaginal and rectal examinations. The membranes were unruptured in 4. The average morbidity was 12.2 days. The onset of the temperature was on the day of operation in all but one. Six of the cesarean sections were primary and 1 was secondary. The average life of the patient following operation was 12.5 days. The hemoglobin averaged 57.4 per cent; the red cells for 5 cases, 3,200,000, and the leucocytes in 6 cases were 15,000, with an average of 89 per cent poly-

CESAREAN DEATHS FROM SEPSIS

WITHOUT MERCUROCHROME

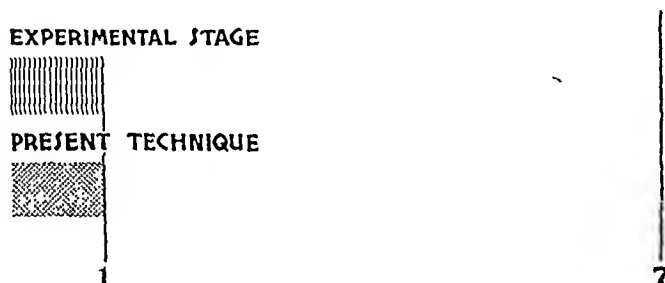


Fig. 4.

morphonuclears. The blood cultures were not taken in 3, were negative in 3, and in 1 a streptococcus was recovered. Postpartum infection was the factor that determined the deaths of this series of cases. There were other contributing factors; such as, eclampsia, toxemia, and anemia, but had the resistance of the patients not been lowered by these conditions, they might have been able to take care of the infection.

In the miscellaneous group there were 3 cases; one a premature labor which was induced for toxemia, 8 minims of pituitrin given during labor, and the autopsy showed a small perforation in the fundus of the uterus, which caused a peritonitis. Another was a five and one-half months' abdominal hysterotomy for a preclampsic toxemia and chronic nephritis. The last of this series was a very interesting case diagnosed as varicella, the patient dying from a hemolytic streptococcus before delivery.

B. EXPERIMENTAL STAGE OF MERCUROCHROME

In this experimental mereurochrome group, there were 8 deaths from sepsis following viable vaginal deliveries. This includes 2 patients who did not die on the obstetric service. One was transferred to the surgical service because of the development of abscesses and the other, a suspected

typhoid, died on the medical service. The average age was 29.5 years. Three were primiparae, and 5 multiparae. Four were followed by rectal examinations only, 2 had vaginal, and 2 both rectal and vaginal examinations. The average duration of dry labor for 7 cases was 4.6 hours, while in 1 the membranes were ruptured several days before admission. The labor lasted for an average of 4.4 hours in 7, and in the other, 37 hours. The deliveries were spontaneous in 4, and in the rest, low or prophylactic forceps. One had no mercurochrome at all, another only at delivery, and the rest averaged 6.2 hours from instillation to delivery. One had fever before delivery, and the average day of onset for the rest was 2.2 days. The duration of illness averaged 15.5 days. The red cells averaged 3,500,000.

The large number of septic deaths in this period may be accounted for partly by the fact that our technic was faulty, but it is interesting to note that 1 patient did not have any mercurochrome, 1 only at delivery, another admitted with a temperature, was in labor for 37 hours and instilled only 2 hours before delivery. Then there were 4 deaths during the epidemic of puerperal sepsis in the spring of 1927. Of these patients 3 were multiparae, 3 had rectal examinations, and only 1 had a single vaginal examination. The labor averaged a little over 4 hours each and not one of the deliveries was operative. Hemolytic streptococcus was obtained from the blood of each one. The patients were removed to the isolation ward at the onset of symptoms, and although there were other patients there, no new cases developed in the isolation ward. The babies of these mothers were not affected. The patients were delivered on the following dates: January 12, February 25, March 15, and April 10. In no other cases did we recover the hemolytic streptococcus, and we feel that these were individual isolated cases and that contact was no factor. Although the delivery may have played some part in the development of the sepsis, we doubt if the infection entered by way of the vagina. Many other patients were delivered during this same period by forceps, version, induction by bag, and cesarean section, but not one of these developed a puerperal sepsis. Thus we felt that we were justified in keeping our wards open and considering these deaths as due to causes over which we had no control. We further believe that if we had not been using the mercurochrome preparation for delivery, we would have had instances of virulent sepsis in our operative cases as well, and would undoubtedly have had to close our wards as was done at the Sloane Maternity under similar circumstances.

During this period there were 177 cesarean sections with 1 death from sepsis. A rate of 1 in 177, as compared with 1 in 37.8 when no mercurochrome was used.

This patient died from sepsis in spite of the use of mercurochrome. She was a primipara with unruptured membranes, who went into shock during the anesthesia. She bled profusely during the operation and later developed a generalized

peritonitis. Dr. Beach, in commenting on this case before the New York Obstetrical Society, stated that "There was a possibility that the intestines had been punctured during the sewing up of the peritoneum. The patient took the anesthetic poorly and while sewing up the peritoneal cavity, she was coughing and protruding her intestines into the wound."

C. PRESENT MERCUROCHROME TECHNIC

In the last 5,000 cases occurring in the hospital, there was only 1 death due to sepsis following vaginal deliveries with viable babies. This patient was a para ii, thirty-six years old, who was instilled two hours before an easy spontaneous delivery. The membranes were ruptured at the time of delivery and she was in labor but nine hours. Autopsy showed that the infection spread from the placental site, that there was a thrombosis of the left ovarian and renal veins and a thrombus in the left ventricle. A staphylococcus was obtained from the blood stream.

There were 177 cesarean sections in this last period and again only one death that could be attributed to sepsis. This woman was a poor candidate for cesarean section. She was thirty-nine years old, a para iv; the membranes had been ruptured before admission and at least five days before the operation. She had been in labor for thirty-four hours and died from a peritonitis on the fourth day. The indication for cesarean section was an old trachelorrhaphy which interfered with the cervical dilatation. When the baby was delivered there was a definite sapremic odor and the uterus was undoubtedly infected before the time of the operation. If this uterus had been instilled with mercurochrome one hour before the operation, infection might have been avoided. There is a possibility that a low cesarean section or a hysterectomy may have saved this patient.

There was one other death from sepsis during this series, a para iii, thirty-three years old, who had chills and fever for two days before admission; had a five and one-half months' miscarriage, and the placenta showed evidence of infection as it was loaded with pus cells. An autopsy showed a pelvic thrombophlebitis.

SUMMARY

1. In a study of the maternal mortality following 15,647 deliveries, the cases are divided into three groups of approximately 5,000 each. The first group, when no vaginal antiseptic was used, covered a period from 1919 through 1924; the second, or experimental mercurochrome group, from 1925 through 1927; and the third group, with the latest mercurochrome technic, from 1928 to August, 1930.*

2. There were as many maternal deaths in the 5,000 deliveries before the use of mercurochrome as there were in the 10,000 following its use.

*From August 1, 1930, to January 1, 1932, there were 2695 deliveries with 3 maternal deaths, and 103 cesarean sections with 1 maternal death. Two of these were due to eclampsia; 2 were due to postpartum hemorrhage, 1 of which had a ruptured uterus. There has been 1 death from puerperal sepsis in 7797 vaginal deliveries.

3. Leaving out the cesarean sections, there were twice as many maternal deaths during the first 5,000 cases as there were during the last 5,000 cases, while with vaginal deliveries of viable children, there were four times as many in the first series.

4. The death rate from cesarean sections in the first group was 7.1 per cent and in the second and third groups, 2.6 per cent.

5. Shock and hemorrhage accounted for 8 deaths in the first series, 2 in the second and 2 in the third.

6. Eclampsia was given as the cause of 3 maternal deaths following the vaginal delivery of a viable child and 4 deaths following cesarean section in group one, while in the mercurochrome series, there was but one death from eclampsia in the vaginal deliveries of viable children.

7. In the first group there were 17 deaths from sepsis, 9 in the second, and 4 in the third.

Of the vaginal deliveries of viable children there were 6 deaths from puerperal sepsis in the first group, 8 in the second, and 1 in the third. Following cesarean section, there were 7 deaths from sepsis in the first group, 1 in the second, and 1 in the third.

8. In the last group but one of the deaths followed the vaginal delivery of a viable child. One followed cesarean section, and the third, a five and one-half months' miscarriage which was infected before admission.

CONCLUSIONS

If puerperal sepsis accounts for one-third to one-half of all maternal deaths, and is a preventable disease in which there has been no decrease during the last twenty-five years, does it not seem logical that the use of a vaginal antiseptic during labor and delivery might reduce the number of maternal deaths from this cause?

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494 FIRST STREET

THE AGE DISTRIBUTION OF 15,370 OBSTETRIC PATIENTS
AND ITS EFFECT UPON THE TYPE OF DELIVERY

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IN RECENT years, a number of communications have appeared dealing with the obstetric risk rate as affected by the age of the patient. Most of these articles have concerned themselves chiefly with the so-called young or elderly primipara, and very few have attempted to present a cross section of the entire childbearing population. Therefore, it seemed of interest to investigate the age of a large series of women delivered in one community during a period of a number of years. There was approximately the same number of primiparae and multiparae in the group. Also the white and black races were about equally represented, thus making possible the investigation of age racial differences. Finally, a brief study was made concerning the influence of age on the type of delivery, with reference to race and parity.

It may be stated that less than 10 per cent of the cases in this series were private. The great majority were ward patients, and most of these of a social stratum so low that they were not able to pay the moderate ward fees. In other words, this series does not present a typical picture of society as a whole, but rather that of the crowded industrial districts of a large city.

For this investigation, we have taken a series of 15,370 consecutive deliveries on the obstetric service of the Johns Hopkins Hospital during a period of approximately 23 years (January 1, 1907, to December 31, 1929). Only such women as were delivered after the fetus had reached a period of viability (1500 gm.) have been considered.

The distribution of the patients according to race and parity is as follows:

TABLE I.

	WHITE		BLACK		TOTALS	
Primiparae	4058	(26.40%)	4348	(28.29%)	8406	(54.69%)
Multiparae	3747	(24.38%)	3217	(20.93%)	6964	(45.31%)
Totals	7805	(50.78%)	7565	(49.22%)	15,370	

Table I shows that the total number of whites and blacks very closely approximate one another. On the other hand, there is a wider difference between primiparae and multiparae, there being relatively more primiparae among the blacks than the whites; yet the total in each rubric seems sufficiently large to make our analyses of considerable significance.

Table II shows that the mean age for the entire group of patients is just under 24 years. There is a difference of 6.44 years between the average primipara and multipara. This difference is greater in the white race (6.88 years) than in the black (5.70 years). The mean age throughout is less in the black than in the white. The average black woman in Baltimore has her first baby at the age of 19.93 years, which is 1.97 years earlier than the white. An even greater difference (3.15 years) is observed between the multiparae. These variations may at

TABLE II. FREQUENCY DISTRIBUTION OF PATIENTS ACCORDING TO AGE, PARITY AND COLOR

	AGE							UN- KNOWN	TOTAL	MEAN AGE
	-16	17-19	20-24	25-29	30-34	35-39	40-			
White para 0	299	1347	1649	489	172	80	21	1	4058	21.89735±0.04905 years
White para x	5	202	1007	1037	797	491	199	9	3747	28.77740±0.06888 years
Black para 0	806	1976	1180	269	75	37	4	1	4348	19.92810±0.03668 years
Black para x	28	507	1244	737	373	242	85	1	3217	25.63120±0.07242 years
Both para 0	1105	3323	2829	758	247	117	25	2	8406	20.87875±0.03121 years
Both para x	33	709	2251	1774	1170	733	284	10	6964	27.32240±0.04675 years
Total white	304	1549	2656	1526	969	571	220	10	7805	25.19660±0.04933 years
Total black	834	2483	2424	1006	448	279	89	2	7565	22.30035±0.04200 years
Total pts.	1138	4032	5080	2532	1417	850	309	12	15,370	23.86150±0.03161 years

first glance seem rather small; but if they be tested by the division of the difference by its probable error, they may be shown to be statistically significant. Thus we find that with a difference of 1.97 years between the mean age of white and black primiparae, the probable error is 0.06 years, so that the difference is 32.12 times its probable error. Since any difference that is three or more times its probable error is usually considered significant, it is highly improbable that the above figure is due to chance. Similarly, applying the same test to the white and black multiparae the $\frac{\text{Diff.}}{\text{P.E.}}$ diff. = 31.50, and for total white and black patients equal 44.74. From the foregoing discussion, it seems evident that not only does the colored woman begin her childbearing career

TABLE III. INCIDENCE OF PATIENTS PER THOUSAND DELIVERIES ACCORDING TO AGE, PARITY, AND COLOR

	AGE						
	-16	17-19	20-24	25-29	30-34	35-39	40-
White para 0	74	332	406	121	42	20	5
Black para 0	185	455	271	62	17	9	1
White para x	1	54	270	278	213	131	53
Black para x	9	158	387	229	116	75	26
Total para 0	132	396	336	90	29	14	3
Total para x	5	102	324	255	168	105	41
Total white	39	199	341	196	124	73	28
Total black	110	328	321	133	59	37	12

at a definitely earlier age, but that there appears to be a shorter time interval between successive pregnancies. Tables III and IV offer further evidence in support of the points just adduced. Thus, practically two-thirds of the black women have their first delivery before they reach the age of 20; which is true of only two-fifths of the white. Furthermore, one-sixth of the blacks have become multiparae by this age, as contrasted with one-twentieth of the whites. On the other hand, only 2.7 per cent of the black primiparae are 30 years or more of age, while 6.7 per cent of the whites fall in this group, an incidence two and one-half times as great.

TABLE IV. PERCENTAGE DISTRIBUTION OF PATIENTS ACCORDING TO AGE, PARITY, AND COLOR

AGE	Black						White					
	PR.	%	M.	%	BOTH	%	PR.	%	M.	%	BOTH	%
Below 20	2782	64.0	535	16.6	3317	43.9	1646	40.6	207	5.5	1853	23.8
20 - 29	1449	33.3	1981	61.6	3430	45.1	2138	52.7	2044	54.7	4182	53.6
30 or over	116	2.7	700	21.8	816	10.8	273	6.7	1487	39.8	1760	22.6
Total	4347		3216		7563		4057		3738		7795	
Both Races												
				PR.	%		M.	%		BOTH	%	
	Below 20			4428	52.7		742	10.7		5170	33.7	
	20 - 29			3587	42.7		4025	57.9		7612	49.6	
	30 or over			389	4.6		2187	31.4		2576	16.8	
	Total			8404			6954			15,358		

Again, it may be seen in Table III that out of a thousand white primiparae the rubric for maximum occurrence is age 20 to 24, as compared with the age 17 to 19 for the blacks. Considering as a young primipara a girl delivered before the age of 17, and as an elderly primipara a woman of 35 years or over, we arrive at the following figures, which again support the previous statements:

	WHITE	BLACK
Young primiparae	7.4%	18.5%
Elderly primiparae	2.5%	1.0%

Furthermore, our figures seem to indicate that the colored multipara finishes her childbearing career earlier than the white, since only 21.8 per cent of the former as against 39.8 per cent of the latter are over thirty years of age. Tables V and VI indicate that when the cases under discussion are subdivided according to type of delivery, still further racial differences become evident. The arbitrary division used here is full-term spontaneous, full-term operative, and premature (under 2500 gm., both spontaneous and operative). Despite the fact that the incidence of contracted pelvis is two and one-half times greater in the colored race, the percentage of operative deliveries in primiparae is less than among the whites. However, in multiparae the opposite is

TABLE V. PERCENTAGE DISTRIBUTION OF TYPES OF DELIVERY ACCORDING TO COLOR AND PARITY

	<i>White</i>				<i>Black</i>				<i>Both Races</i>			
	PARA 0 CASES	%	PARA X CASES	%	PARA 0 CASES	%	PARA X CASES	%	PARA 0 CASES	%	PARA X CASES	%
F.T.S.	2943	72.5	2985	79.7	3345	76.9	2389	74.3	6288	74.8	5374	77.2
F.T.O.	936	23.1	570	15.2	693	15.9	535	16.6	1629	19.4	1105	15.9
Prem.	179	4.4	192	5.1	310	7.1	293	9.1	489	5.8	485	7.0
Total	4058		3747		4348		3217		8406		6964	

	PARA 0 AND PARA X				TOTAL PATIENTS	
	<i>White</i> CASES	%	<i>Black</i> CASES	%	CASES	%
F.T.S.	5928	75.95	5734	75.80	11,662	75.87
F.T.O.	1506	19.30	1228	16.23	2,734	17.79
Prem.	371	4.75	603	7.97	974	6.34
Total	7805		7565		15,370	

TABLE VI. FREQUENCY DISTRIBUTION OF TYPE OF DELIVERY ACCORDING TO AGE, PARITY, AND COLOR

	- 16				17 - 19				20 - 24				25 - 29			
	F.T.S.	F.T.O.	PREM.	TOTAL	F.T.S.	F.T.O.	PREM.	TOTAL	F.T.S.	F.T.O.	PREM.	TOTAL	F.T.S.	F.T.O.	PREM.	TOTAL
White para 0	236	49	14	299	1071	205	71	1347	1206	373	70	1649	303	171	15	489
Black para 0	623	122	61	806	1572	269	135	1976	903	194	83	1180	179	68	22	269
White para x	3	2	0	5	180	13	9	202	875	87	45	1007	828	166	43	1037
Black para x	20	3	5	28	389	70	48	507	981	169	94	1244	544	129	64	737
Total para 0	859	171	75	1105	2643	474	206	3323	2109	567	153	2829	482	239	37	758
Total para x	23	5	5	33	569	83	57	709	1856	256	139	2251	1372	295	107	1774
Total white	239	51	14	304	1251	218	80	1549	2081	460	115	2656	1131	337	58	1526
Total black	643	125	66	834	1961	339	183	2483	1884	363	177	2424	723	197	86	1006
Total Pts.	882	176	80	1138	3212	557	263	4032	3965	823	292	5080	1854	534	144	2532

TABLE VI. FREQUENCY DISTRIBUTION OF TYPE OF DELIVERY ACCORDING TO AGE, PARITY, AND COLOR (CONTINUED)

	30 - 34				35 - 39				40 -			
	F.T.S.	F.T.O.	PREM.	TOTAL	F.T.S.	F.T.O.	PREM.	TOTAL	F.T.S.	F.T.O.	PREM.	TOTAL
White para 0	92	77	3	172	28	46	6	80	6	15	0	21
Black para 0	42	25	8	75	22	14	1	37	3	1	0	4
White para x	626	129	42	797	340	118	33	491	129	52	18	199
Black para x	265	73	35	373	136	71	35	242	53	20	12	85
Total para 0	134	102	11	247	50	60	7	117	9	16	0	25
Total para x	891	202	77	1170	476	189	68	733	182	72	30	284
Total white	718	206	45	969	368	164	39	571	135	67	18	220
Total black	307	98	43	448	158	85	36	279	56	21	12	89
Total Pts.	1025	304	88	1417	526	249	75	850	191	88	30	309

true, though not to any marked extent. The lower average weight of the black infant and the increased malleability of its head may partially account for this fact. It will also be noted that the incidence of premature children is higher in the blacks, but in both races it occurs more commonly in the multiparous woman.

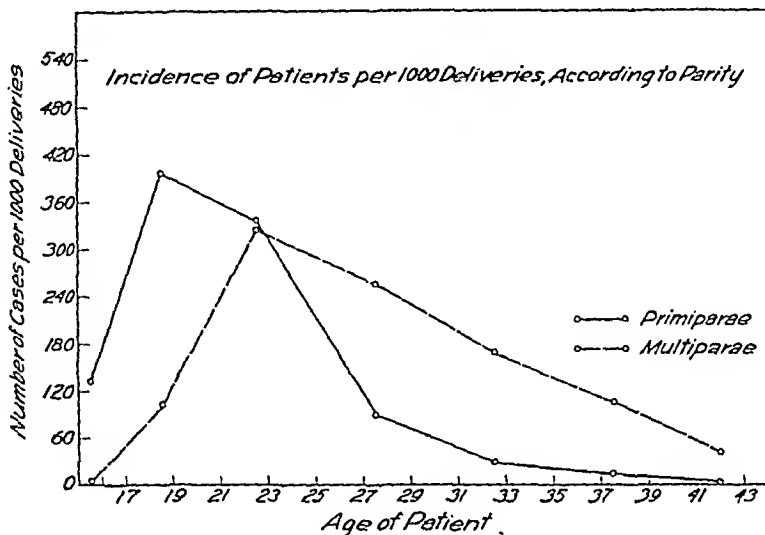


Fig. 1.—The age incidence of primiparae and multiparae of both races in terms of 1000 deliveries.

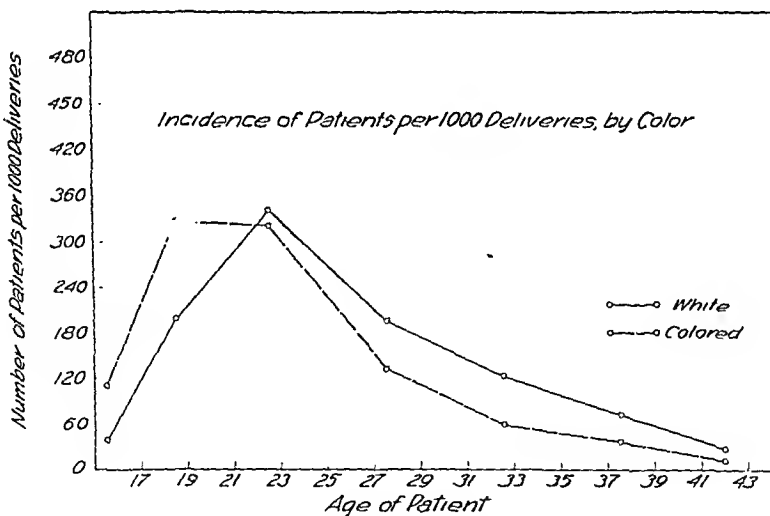


Fig. 2.—The age incidence according to race of combined primiparae and multiparae in terms of 1000 deliveries. Note that the black woman tends to begin and end her childbearing career earlier than the white.

There is a surprisingly high incidence of operative deliveries in the multiparae of both races. We consider our primiparous population as a fairly representative one, but the ratio of referred obstetric emergencies to normal cases among the multiparae is quite high and probably is the explanation of the above findings.

Figs. 1 to 6 indicate very clearly the influence of age on the type of delivery. For primiparae, the incidence of premature delivery seems little changed by age. However, in primiparae of both races beginning at an optimum between 17 and 19 years, the percentage of spontaneous

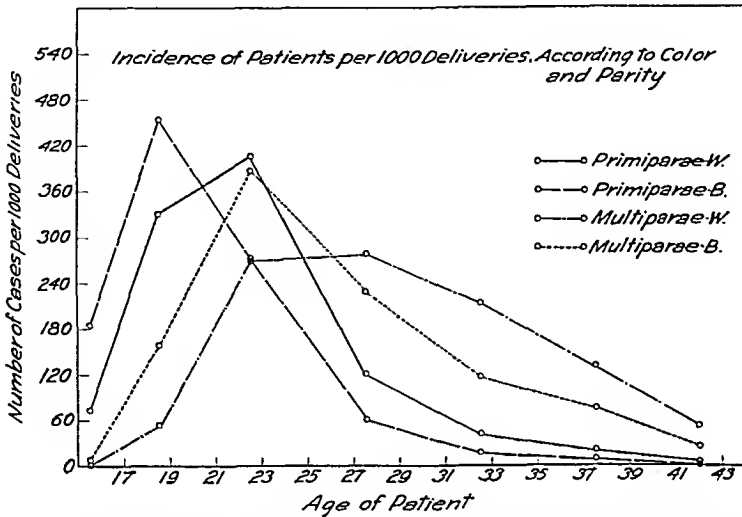


Fig. 3.—Showing age incidence in primiparae and multiparae of both races. Indicating that the greatest frequency of both first and subsequent labors occurs earlier in blacks than in whites, and that white women tend to bear more children in the later years of their reproductive career.

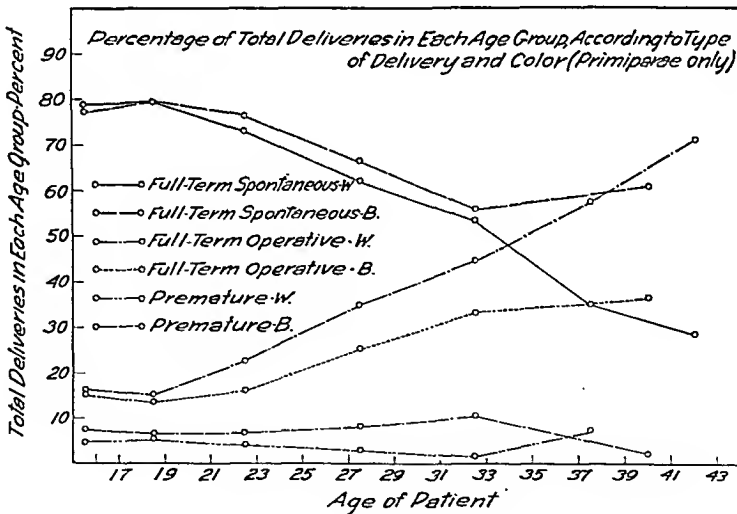


Fig. 4.—Showing the increased incidence of operative deliveries with advancing age in both races. Note that after the thirty-fourth year, there are more operative than spontaneous deliveries in white women.

deliveries begins to fall and is accompanied by a corresponding increase in the number of operative labors. In the white race a point is reached in the late thirties where there are more operative than spontaneous labors, whereas this does not obtain in the blacks. The same tendency, though not to such a marked extent, is observed among multiparae. In

the later age group the number of cases from which these percentages are obtained is in some instances so small as to make probable a considerable error of chance. Nevertheless, it is believed that the general trend of the lines would hold for a larger series. The practical appli-

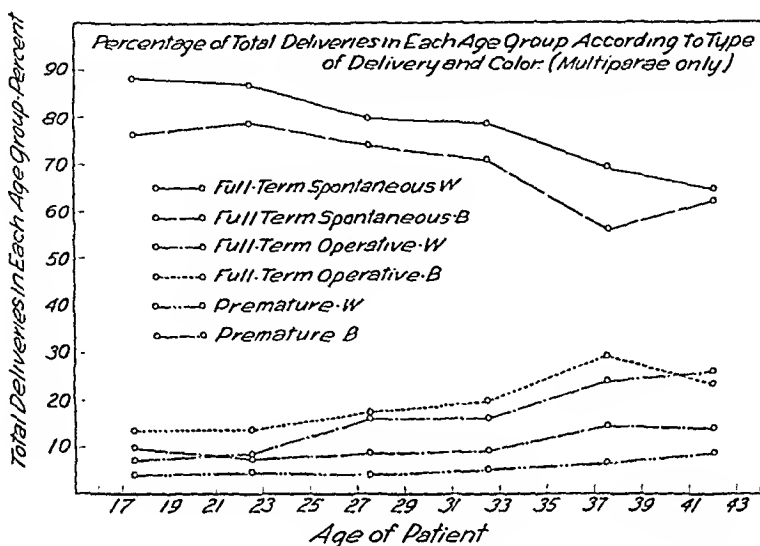


Fig. 5.—Showing that there are more spontaneous and fewer operative deliveries in white than in black multiparae at all ages. Note the greater incidence of premature deliveries in the black race.

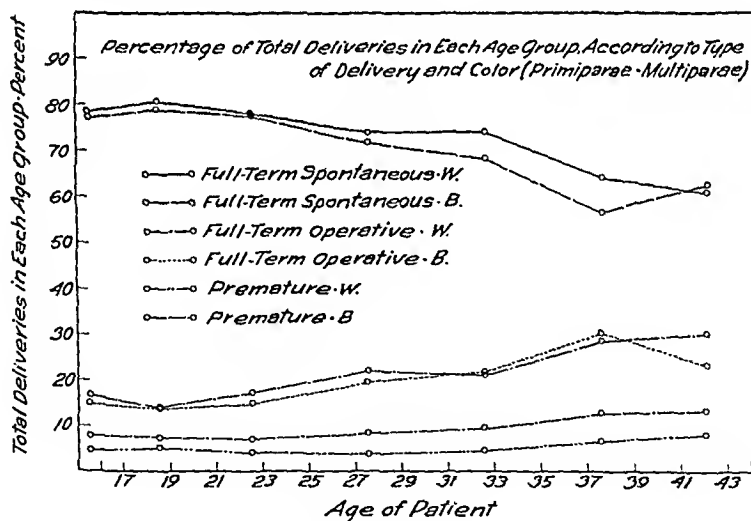


Fig. 6.—Represents the combination of Figs. 4 and 5, and shows that for all women of both races (primiparae and multiparae) the proportion of spontaneous to operative delivery is essentially the same

cation of these findings will be discussed more fully in a subsequent communication, when the correlation between type of delivery and fetal mortality will be shown.

Racial differences according to the influence of age on the type of delivery are not so marked. However, throughout there are more pre-

mature babies in the black women. The percentage of spontaneous terminations to labor does not fall as rapidly in the blacks, and the spontaneous and operative lines do not cross with increasing age as is observed among white women.

It is interesting that for both races the very young woman (under 17) has a slightly higher operative incidence than is found at the optimum point, which falls between 17 and 19 years.

CONCLUSIONS

1. The mean age of 15,370 obstetric patients, divided almost equally between the white and black races, and containing primiparae and multiparae in almost equal numbers, is just under 24 years. A difference of 6.44 years exists between primiparae and multiparae.

2. The mean age is significantly lower in black than in white primiparae (1.97 years); and an even greater variation was observed in the multiparae (3.15 years).

3. The number of "young primiparae" (under 17) is greater among the black race, while fewer "elderly primiparae" (35 or over) are found.

4. The childbearing career seems to end earlier in the black than in the white woman.

5. The ratio of operative to spontaneous deliveries at term is lower among black primiparae despite a much higher incidence of contracted pelvis. Likewise, a higher percentage of pregnancies terminating prematurely is observed in this race.

6. In both races, the percentage of operative deliveries increases with age and in the whites reaches a point in the late thirties where it exceeds the spontaneous type.

7. The probability of spontaneous termination of labor appears to be less good in very young women than in the age group of 17 to 19 years.

TABLE I. BLOOD CHEMISTRY FINDINGS

DATE	PER CENT			MG. PER CENT		VOL. PER CENT CO ₂	P _H
	Hb	CELL VOL.	SER. PROT.	N. P. N.	CHOL.		
2-6-31	125	50	5.8	43	734	49	7.47
2-7-31	125	50	6.3	26	518	45	7.40
2-8-31	111	39	4.2		270	45	
2-9-31	105	40	4.1	23	390	47	7.45
2-10-31	118	47	5.4	25	250	46	7.40

There was a slight retention of nitrogen which disappeared as soon as a diuresis was established. The marked concentration was not relieved by the glucose injection as the protein percentage was still high the following morning. There was a 20 per cent to 25 per cent increase in blood volume following the administration of acacia solution as determined by the drop in hemoglobin, cell volume, and serum protein. This hydration persisted for seventy-two hours before water was again being lost from the blood.

An increased serum cholesterol is characteristic of the toxemias of pregnancy but

TABLE II. RESUME OF CLINICAL COURSE, TREATMENT, AND URINARY FINDINGS

DATE	CLINICAL CONDITION			TREATMENT	URINE		
	T. P. R.	WT.	B. P.		AMOUNT C.C.	CHLORIDES	
						GM.	PER CENT
2-6-31 12 hr.	Headache Drowsy 37°-96-20	Edema Eye Signs 176/130		1000 c.c. 20% Glucose 1000 c.c. Diet — 2000 c.c. Total	1800	0.91	0.065
2-7-31	No Headache Less Edema Improved Vision 36.5°-82-18		175/140	1000 c.c. 6% Acacia 2700 c.c. Diet — 3700 c.c. Total	3200	2.97	0.110
2-8-31	Well 36.7°-88-20		178/140	2930 c.c. Diet — 2930 c.c. Total	1800	2.64	0.120
2-9-31	Slight Nausea Restless 36.5°-88-22		185/140	3050 c.c. Diet — 3050 c.c. Total	1900	0.64	0.032
2-10-31	Nausea and vomiting Headache Epigastric pain Epistaxis Edema 36.5°-90-18		195/160	1600 c.c. 20% Glucose 6% Acacia 850 c.c. Diet — 2450 c.c. Total	900		
	67.1 K Delivery Death						

this was one of the highest ever found by us. No explanation is offered for the tremendous drop unless the pathologic lesions of the liver are responsible.

The acid-base balance was always normal.



Fig. 1.—Gross specimen of liver; anterior surface showing marked involvement of the liver with hemorrhage. Typical eclamptic liver in the gross.

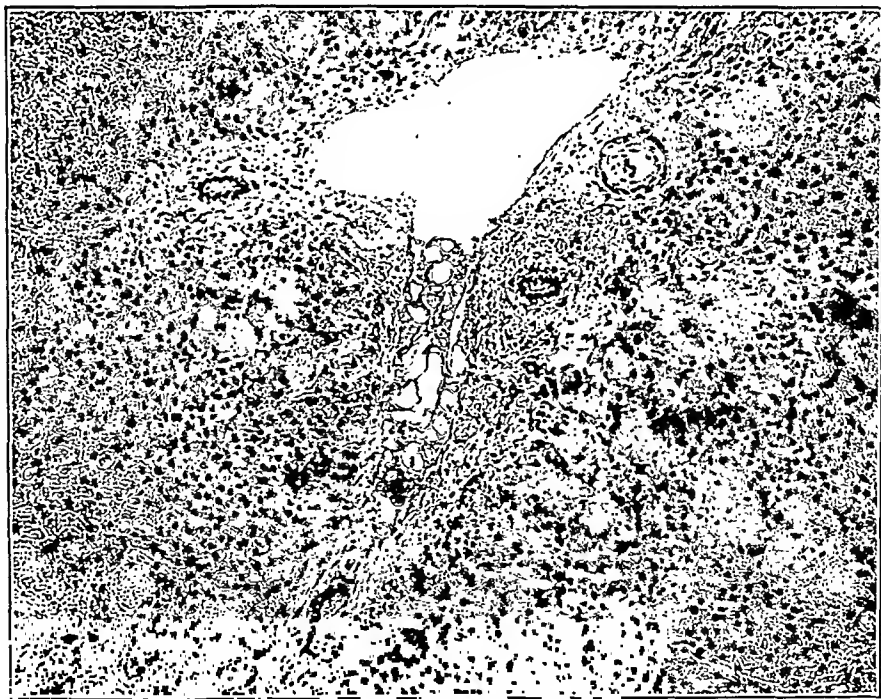


Fig. 2.—Shows small portal space with portal vein, hepatic artery, and bile duct. Note marked extravasation of blood into periportal tissue as well as into the distended sinusoids. The red blood cells are in great part hemolyzed.

Table II illustrates the marked increase in urinary output and chlorides after the acacia injection.

The most important single feature brought out in the observation of this case was the striking clinical improvement coincident with the hydration of the blood and the return of unfavorable symptoms with the return of blood concentration.

PATHOLOGY

Autopsy was performed by the Department of Pathology immediately following death. For the sake of brevity only those portions of the pathologic report relative to the liver and kidney are included.

Gross Description.—The liver weighed 1920 gm. and measured 25 by 18 by 9 cm. It was covered by a smooth capsule which was shiny and glistening. The right lobe

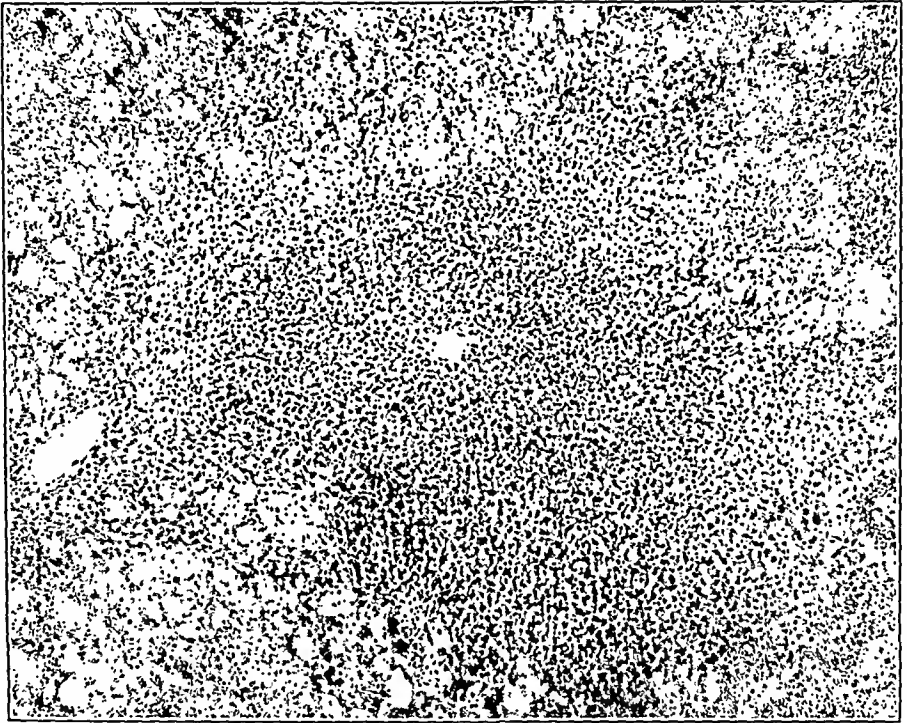


Fig. 3.—Shows marked hemorrhage and destruction of liver tissue in the periphery of the lobules. The central vein in the center of the picture and liver cells immediately surrounding it are normal.

appeared to be projecting prominently above the rest of the anterior surface of the liver. The superior surface of the anterior view showed a mottling of reddish to brown blotches which varied in size from pinpoint to confluent areas, one-third to one-half the size of the palm of the hand. There was one very large area of brownish hemorrhagic appearance over the lower part of the anterior surface which was 8 cm. in diameter. Radiating out from this large area were smaller projections which appeared as an interlacing network over almost the entire anterior surface of the liver. All the area between these hemorrhagic areas was yellow. To palpation the hemorrhagic areas were quite solid, while the yellow areas were softer and slightly depressed. The left lobe had the same appearance, and there were only several places on this anterior surface which did not show the hemorrhagic blotches. Adjacent to the fissure formed by the falciform ligament and extending right to the bare area of

the liver forming a V, there was a solid area of hemorrhage which seemed to follow a line around the periphery of the bare area on the superior surface.

Viewed from behind the gastric depression showed the discoloration noted on the anterior surface. The tuber omentale just to the right of the gastric depression was raised and mottled with extensive coalescing hemorrhagic spots. The caudate lobe was practically all covered with the hemorrhagic blotches. The quadrate lobe contained a great number of hemorrhagic areas but not as many as the caudate lobe. The posterior surface of the right lobe appeared to be very shotty with the hemorrhagic areas. This hemorrhagic mottling was most particularly noted near the inferior vena cava fossa. This particular distribution of the hemorrhagic areas was also noted on the left lobe from behind near the fossa for the ductus venosus. There was an appreciable increase in hemorrhage near the fossa for the umbilical vein as well.

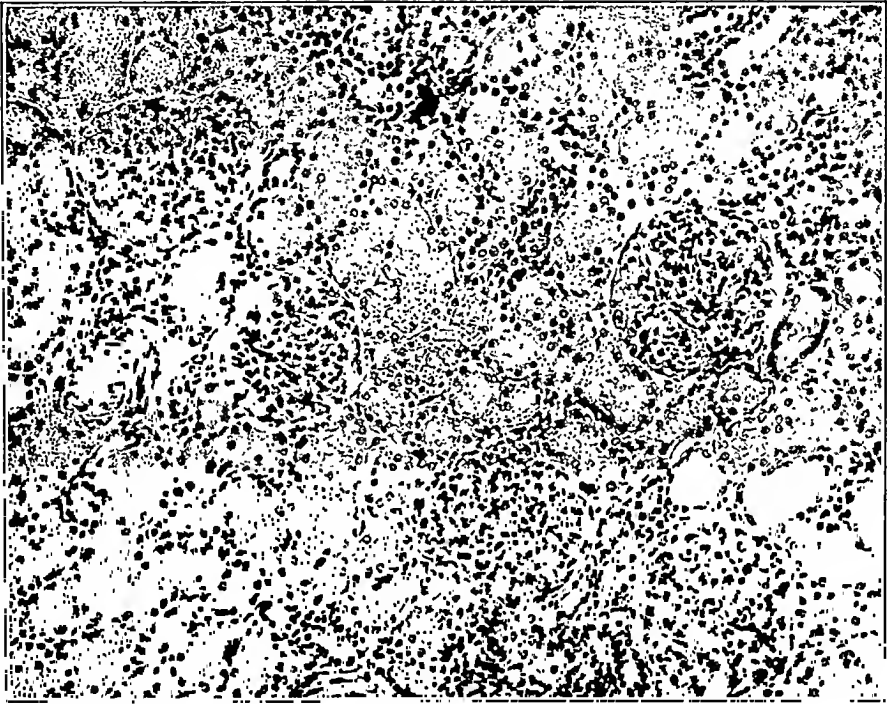


Fig. 4.—Kidney. Shows the convoluted tubules in a state of hyaline degeneration. The cells of the glomerular tufts are markedly swollen causing the glomerulus to fill out the entire capsule. This picture is similar to that described by Fahr as being typical of eclampsia.

Each kidney weighed 170 m., and measured 11 by 6.5 by 4.5 cm. The capsule was smooth and free from any adhesions. On cut section the capsule retracted readily; it stripped easily from the cortex leaving a smooth but pale cortical surface. The cut surface of the kidney was pale and appeared markedly swollen. The right ureter was dilated in about its middle third, apparently due to pressure by the pregnant uterus.

Microscopic Description.—The liver showed many interesting things which were brought out by Mallory connective tissue stain. In the hematoxylin and cosin stain, one saw areas of blood around the portal spaces. Many of these areas appeared to be simply distended capillaries or sinusoids filled with blood cells, but with the connective tissue stain one saw that the blood was definitely outside the capillary lining of the sinusoids. The capillaries were seen as flat endothelial tubes compressed by collections of red blood cells outside the capillary walls. The endothelial cells of

the capillary walls appeared to be tremendously swollen. Other areas showed a definite degeneration of the liver cord cells with areas of hemorrhage scattered throughout the degenerated cells of the liver cords. However, many of the areas did not show much degeneration of the liver cells. In the liver one saw that many of the capillaries contained thrombi of red blood cells which appeared to be agglutination thrombi.

With a Mallory connective tissue stain of the kidneys one saw that the epithelial cells which covered the glomerular tufts were tremendously swollen, standing out as globular dark blue cells over the capillary tufts. In many of the collecting tubule cells one saw free hemorrhage. All of the capillaries were markedly engorged with blood cells. Many of the tubules contained hyaline casts. Many of the tubule cells were seen to be in a stage of hyaline degeneration. There was extreme cloudy swelling with albuminous degeneration of the tubular epithelium. In the space between the glomerulus and capsule of Bowman in many instances one saw a pink staining material which resembled fibrin. There was an extreme congestion.

Anatomical Diagnoses.—(1) Eclampsia gravidarum; (2) thrombi in branches of portal vein with areas of hemorrhage; (3) cloudy swelling of kidneys.

SUMMARY

1. An unusual case of eclampsia without convulsions or coma is reviewed with special reference to some of its most outstanding clinical, laboratory, and postmortem features.

2. Attention is again called to the prime importance of establishing and maintaining blood dilution in eclampsia.

3. A possibly much more adequate therapeutic agent (acacia) for producing a more lasting hydration of the blood is suggested.

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A STUDY OF BLOOD AND URINARY AMYLASE IN PREGNANCY AND ITS LATE TOXEMIAS

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NUMEROUS studies have been made upon a starch splitting ferment present in the blood, urine, and feces. According to most workers, the principal source of this amylase is the pancreas,¹ and from this organ the ferment gains entrance to the intestinal tract and blood, and is excreted in the feces and urine.² In a review of the literature, one is struck by the varied results and conflicting opinions. The urine has shown marked fluctuations, but determinations made upon the feces have shown such wide variations, that no normal value can be accepted. However, fairly constant quantities have been found in the blood.

In the normal individual, Cohen³ found fairly constant quantities in the blood, but marked variations in the urine. Digestion seemed to play a part in the rise, in that amylase was absorbed into the blood and quickly excreted in the urine. Reid⁴ found diurnal variations in healthy subjects. Higher values were obtained from night specimens of urine, the diastatic value being found to vary inversely with the rate of excretion, and directly with the specific gravity. Some variation was found in the blood, the lowest level occurring from the fourth to eighth hour following a meal. In cases of chronic kidney disease, there was a lowered amount in the urine, while in some cases of acute nephritis, the amount was raised.

Both Stocks⁵ and Block⁶ arrived at similar conclusions, and attempted to put some importance upon this test as a measure of kidney function, in that secretory damage diminished the amount in the urine, and raised the quantity in the blood.

Corbett⁷ found the urinary amylase usually greater than that in the blood. With a rise in the blood amylase, there was an associated rise in that of the urine. He considered, that when the serum value exceeded that of the urine, there was evidence of renal insufficiency. He found that ordinary changes of diet, the reaction of the urine, the presence of bacteria, or any other abnormal constituent except blood, produced no alterations in amylase values.

Corbett also states that there was no change during pregnancy or the puerperium, but there was a rise in urinary amylase in cases of eclampsia, with a return to normal during the period of recovery. He explains this high urinary value found in eclampsia by amylase leaking through with the albumen which has required no renal activity for elimination. Piano⁸ also found that a rise in the blood caused an increase in the urine. In tracing these values through pregnancy, he found a gradual rise up to parturition, with a drop to normal or below during the puerperium. By employing a diastatic index of both blood and urine values, he attempted to estimate renal function. Wallis⁹ placed considerable prognostic and diagnostic importance upon diastatic determinations of the urine, in the differential diagnosis of the toxemias of pregnancy. There was a diminution in nephritis, but an elevation in the other toxemias. These changes he found to take place early in the clinical course, and persist for some time afterwards.

In estimating kidney function, Stafford and Addis¹⁰ concluded that blood and urinary amylase determinations were of little value. They found no diurnal varia-

tion in diastatic excretion, and no relation to pancreatic activity. In cases in which a large proportion of the kidney tissue was rendered functionless by disease, there was a decrease in the urinary output of amylase. McClure and Pratt¹¹ found marked variations in the urino and feces and concluded that these determinations were of but slight value. Elman¹² has shown that disfunction of the pancreas alters the amylolytic content of the blood plasma, which remains within normal limits in the healthy individual.

Perhaps some explanation of the conflicting results obtained lies in the variety of methods used for these determinations. In general these methods did not determine the complete chain of activity of the enzyme.^{13, 14} The starch iodine reaction measures the activity of the ferment only to the disappearance of the starch molecule, while the copper reduction method measures only the sugar forming property. Elman and McCaughan¹⁵ adopted a method which does determine the entire chain of activity, by measuring the reduction in viscosity of a starch solution when acted upon by the ferment.

In brief, the technic^{15, 12} consists in measuring the time required for a 3 per cent starch solution, containing Sørensen's fifteenth molar phosphate buffer at a P_H of 6.8, to flow through an Ostwald viscosimeter tube kept at a constant temperature of $37.5^\circ \text{C.} \pm 0.1^\circ \text{C.}$ This reading, usually about forty-five seconds, is taken as the zero point. The enzyme is supplied by the addition of 0.4 c.c. of blood plasma to the test solution in the tube. Digestion of the starch progresses with time, thereby reducing the viscosity. An arbitrary end point is chosen at 20 per cent reduction of the initial viscosity, and the unit defined as that amount of enzyme in 1 c.c. that will accomplish this in one hour. To avoid the expression of units in the value of time alone, the factor of concentration is added to Arrhenius' rule. In this formula $A.U = 60/T.V.$, A.U equals amylase units per cubic centimeter, T the time in minutes required to reduce the initial viscosity 20 per cent, and V the volume of enzyme solution added to effect this change.

The measurement of urinary amylase presented some difficulty because the dilution of the starch solution, by the addition of urine caused an immediate change in viscosity. Such a discrepancy in viscosity does not exist between the starch solution and blood plasma. To avoid this error, a zero point reading was taken by adding an inactivated sample of urine (heated to 60 to 70°C. for one or two minutes) to the test solution in the viscosimeter tube. After cleaning the tube, the procedure was repeated in the same one using unaltered urine. It was found that the addition of 0.2 c.c. of urine usually caused the end point to be reached at a convenient time. To avoid any diurnal variations, an aliquot portion of a twenty-four-hour specimen was used. After determining the number of units per cubic centimeter, the total output of units was obtained by multiplying the number of centimeters per twenty-four hours by the number of units per cubic centimeter. For example, if the addition of 0.2 c.c. of urine to 5 c.c. of the starch solution caused a 20 per cent reduction in twenty-five minutes, according to the formula $A.U = 60/T.V.$, then

$$A.U = \frac{60}{25 \times 0.2} \text{ or } A.U = 12$$

If the total output of urine in twenty-four hours is 1500 c.c., then

$$12 U \times 1500 = 1800 U.$$

This figure becomes less bulky if a kilounit is established, whereby the total twenty-four-hour output of amylase units becomes 1.8 K.U.

The above technic was employed throughout the following experiments and each controlled, by either a known normal plasma, or a standardized solution of saliva kept with a crystal of thymol at ice box temperature.

The object of this paper is to determine the blood and urinary amylase during pregnancy, and its toxemic complications. We feel that the method employed by Elman is the most accurate one as yet suggested. We therefore feel that figures obtained by this method will be more reliable than those previously appearing in the literature.

The normal blood amylase for pregnancy was first established in the following manner. Hospital cases were used that showed no clinical evidence of any toxemia, i.e., vomiting, nephritis, preeclampsia, or eclampsia. Determinations were made before, during, and after labor in 25 per cent of the cases. In the remainder, blood was taken at only one or two of these stages. The series consists of 27 cases, upon which 37 determinations were made. The age varied from 18 to 37, and both primipara and multipara were included. The values were found to range from 4 to 7 units per cubic centimeter. Table I shows that the majority occurred between 5 and 6. Considering the normal limits between 4 and 7, these results are practically identical to the normal values found by Elman in healthy individuals, both male and female.

TABLE I. BLOOD AMYLASE VALUES IN NORMAL PREGNANCY

NUMBER OF CASES	NUMBER OF DETERMI- NATIONS	CONCENTRATION OF AMYLASE UNITS PER C.C.		
		4-5	5-6	6-7
27	37	27%	43%	30%

In ten determinations made upon normal cases during the course of labor, or first twenty-four hours thereafter, there were seven primipara. Four of these seven were not included in the series mentioned, because they showed values of from 9 to 11.5 units. This elevation may be attributed to the long labor experienced by each of these cases, in which a degree of dehydration and starvation was produced.

TABLE II. URINE AMYLASE VALUES IN NORMAL PREGNANCY

NUMBER OF CASES	NUMBER OF DETERMI- NATIONS	CONCENTRATION OF AMYLASE U. PER C.C.					
		4-10	10-15	15-20	20-25	25-30	30-35
18	22	37%	27%	13%	10%		13%
		TOTAL AMYLASE IN K.U. EXCRETED IN 24 HOURS					
		4-10	10-15	15-20	20-25	25-30	30-35
18	22	22%	13%	23%	23%	10%	9%

In the study of urine values, normal cases of pregnancy were used, the determinations being made before and after delivery in 14 per cent, but only during the puerperium in the remainder. The values varied from 4 to 30 units per e.e., and the total number of units excreted during twenty-four hours from 4 to 35 K. U. Table II shows that the variations were so extreme that no normal values can be accepted for either of these determinations.

Diurnal variations were found in single specimens, and the total output of amylase for the day greater than for the night. The amount of amylase per cubic centimeter was greater in concentrated specimens of urine. Neither P_{II} readings nor the amount of albumin had any effect on the amount of ferment present. It was found that by the addition of a crystal of thymol the amylase of the urine did not depreciate over several days if kept cool.

Although cases with normal kidney function showed these variations in amylase excretion, it is interesting to note the findings in definite kidney disease. Three cases are presented here to illustrate these results.

CASE 1.—A. S., aged twenty-six, gravida II, entered the hospital at three months' gestation because of hypertension, edema, and albuminuria. Nephritic history with toxemic complications during first pregnancy eleven years before. At this admission the urinary output was very scant, phenolsulphonephthalein eight per cent in two hours and nonprotein nitrogen over 100 mg. per cent. The patient was under treatment for three days when she developed a tingling in the left arm, became comatose, dyspneic, and died. Autopsy showed a hemorrhage about the pons, contracted granular kidneys with almost complete destruction of the cortex, and fluid in the body cavities. The only lesion seen in the pancreas was an intimal thickening of the arteries with an occasional lumen obliterated.

CASE 2.—M. H., aged twenty-three, gravida I, entered hospital one month before term because of hypertension, dimness of vision, edema of face and extremities. Patient delivered spontaneously two days later, passing into a semicomatose condition thereafter. Phenolsulphonephthalein excretion was 10 per cent in two hours, and the nonprotein nitrogen rose to over 100 mg. per cent. The urine contained decreasing amounts of chloride after delivery, albumin, and some casts present throughout. The blood pressure dropped on the eighth postpartum day, and two days later the patient died. Autopsy showed multiple infarcts of the kidneys, adrenals, and small intestines, with an intimal thickening of the arteries of these organs as well as the pancreas and the liver.

CASE 3.—D. T., aged sixteen, gravida I, entered hospital at about three months' gestation because of hypertension and general edema present since the beginning of pregnancy. Spontaneously delivered a premature, stillborn fetus. The nonprotein nitrogen slightly elevated at admission, returned to normal, and the blood pressure dropped slightly. Urine contained some albumin, blood, and casts. General condition improved at discharge. Diagnosed acute nephritis.

The results obtained in these 3 cases are shown in Table III. In the first two cases, there was definite kidney damage. The blood amylase was found to be elevated, and the urine values below any found in normal individuals. Perhaps the most important urinary observation is the low total output of amylase, i.e., 0.25 K. U. in Case 1, and 0.24 K. U. in

Case 2 just before death. In view of the fact that three days before delivery in Case 2, the blood was 8.3 U. and the urine 3.0 U. per c.c. with a twenty-four-hour excretion of 2.17 K. U., one would think there was some kidney damage at that time. As the kidney damage became more severe, the blood value rose to 16.6 U. and the urine dropped to 1.5 U. per c.c. with a twenty-four-hour output of 0.24 K. U. Therefore, it would seem that the greater the impairment to the excretion of amylase in the urine, the higher the value rises in the blood. The rate with which amylase is formed, or gains entrance to the blood need not necessarily be changed.

TABLE III. AMYLASE DETERMINATIONS IN PATIENTS WITH DEFINITE KIDNEY LESIONS

CASE NO.	RECORD NO.	NAME	DAYS ANTE- OR POSTPARTUM*	BLOOD U. PER C.C.	URINE		
					VOL. 24 HR. SPEC.	U. PER C.C.	K. U. PER 24 HR.
1	5449	A. S.		10.0	210	1.2	0.25
2	6057	M. H.	A. 3	8.3	725	3.0	2.17
			P. 10	16.6	160	1.5	0.24
3	4125	D. T.	O.	2.8			
			P. 2	1.7			
			P. 9	2.7			
			P. 13	3.2			
			P. 23	3.7			
			P. 30	3.7			

*Day of determination illustrated by:

A. = Antepartum.

O. = During labor.

P. = Postpartum.

Unfortunately there were no urine determinations made in Case 3, as this patient was observed prior to the time this procedure was adopted. The blood values were consistently below normal, with a gradual increase toward normal as the patient improved. Similar low readings were found in other cases of hypertension. Since the blood amylase was not elevated above normal, it is doubtful if any impairment existed in the excretion of the ferment.

In a series of preeclamptic patients, 31 cases were observed with a total of 66 blood determinations. Upon 7 of these, there were 13 twenty-four-hour urine examinations. Both the blood and urine values were found to be lower than those of normal pregnancy. This is shown by comparing Tables IV and V with I and II.

TABLE IV. BLOOD AMYLASE VALUES IN PREECLAMPSIA

NUMBER OF CASES	NUMBER OF DETERMINATIONS	CONCENTRATION OF AMYLASE U. PER C.C.				
		2-3	3-4	4-5	5-6	6-7
31	66	13.5%	21.5%	32.0%	19.5%	13.5%

No typical value can be established for these cases. If symptoms were of long duration, the blood values were found to be lower than in cases of more recent toxic history. The severity of the disease did not seem to play such an important part. After delivery, the blood value increased toward normal as the patient improved, but the urinary amylase showed such irregularities in concentration and total amount, that a similar observation could not be made. It seems likely that if a hypertension exists for any length of time under the influence of a toxic cause in pregnancy, that vascular changes would take place to alter pancreatic activity, or to diminish the absorption of amylase into the blood. With removal of the toxicity and lowering of the high blood pressure, a gradual return toward normal relationship is established.

TABLE V. URINE AMYLASE VALUES IN PREECLAMPSIA

NUMBER OF CASES	NUMBER OF DETERMINATIONS	CONCENTRATION OF AMYLASE U. PER C.C.			
		3.7-10	10-15	15-20	20-25
7	13	70%	23%	7%	
		TOTAL AMYLASE IN K.U. EXCRETED IN 24 HOURS			
		3.7-10	10-15	15-20	20-25
7	13	56%	7%	30%	7%

TABLE VI. BLOOD AND URINE DETERMINATIONS IN CASES OF PREECLAMPSIA SHOWING THE GRADUAL RISE OF THE LOW BLOOD VALUES TOWARD NORMAL DURING THE PUERPERIUM, AND THE IRREGULAR URINE VALUES

CASE NO.	RECORD NO.	NAME	DAYS ANTE- OR POSTPARTUM*	BLOOD U. PER C.C.	URINE		
					VOL. 24 HR. SPEC.	U. PER C.C.	K. U. PER 24 HR.
1	6805	E. D.	P. 5	2.5	1680	11.5	19.3
			P. 6		1380	15.0	20.7
			P. 8		1000	20.0	20.0
			P. 9	3.5	1200	6.2	7.4
			P. 12	4.0			
			P. 15	5.8	1675	5.4	9.0
2	6842	P. G.	A. 1	2.0			
			P. 2	2.3			
			P. 6	3.3			
			P. 7	3.1	1350	3.9	5.3
			P. 12		1840	3.7	6.8
3	11405	L. McL.	A. 6	4.0			
			A. 1	2.1			
			P. 1	3.2	720	7.0	5.0
			P. 1	3.6			
4	6965	A. C.	A. 36	2.6			
			P. 6	2.1			
			P. 10	2.5			

*Day of determination illustrated by:

A. = Antepartum.

P. = Postpartum.

Four of these cases are reported with some detail in Table VI. It would seem in the first one, that since the gradual rise of the blood to normal during the puerperium is accompanied by a drop in the urine, that there may have been some impairment in the excretion of amylase. The patient showed clinical evidence of steady improvement, and this discrepancy is attributed to the irregularity of the urinary amylase, the exact physiology of which is vague. In Case 3, a normal value was found six days before delivery, but as the toxemia advanced a low value was found on the last day of pregnancy. A slight rise occurred on the day of delivery when a cesarean section was done. The patient died rather suddenly from an unexplained cause, possibly an embolism. No postmortem examination was permitted.

It naturally follows, that if preeclampsia shows these low values, one would expect to find even lower values in eclampsia. The eclamptic series consists of 5 cases. These all showed very low values except one, in whom the disease developed rather suddenly. The study of this type of toxemia cannot be considered complete as yet.

The highest values in both blood and urine that have been observed, except in pancreatic disease, were found in cases of vomiting. This study is not sufficiently complete to allow an explanation, and is only mentioned at this time.

DISCUSSION AND SUMMARY

In a study of 71 cases of pregnancy, 112 blood and 38 urine samples were examined for their amylase content. The blood was taken either before, during, or after labor, and the urine from an aliquot portion of a twenty-four-hour specimen. The technic for these determinations was the same as described by Elman and McCaughan, which employs the change in viscosity of a starch solution when acted upon by the ferment. The principle of this method affords more accurate results than those with other quantitative tests. In addition to determining the concentration of amylase units per cubic centimeter of urine, the total amount excreted per twenty-four hours has been expressed in kilo units.

From the results it has been shown that during normal pregnancy the blood amylase remains unaltered and within constant values of 4.0 to 7.0 units per cubic centimeter. These limits are the same as found in healthy individuals both male and female. However, in some primiparae with a long labor, there may be a slight rise at parturition. It is believed that this is due to dehydration, thereby concentrating the blood, and starvation, in which an increased amount of amylase would be employed for the breaking down of polysaccharids such as liver glycogen.

The urinary amylase of normal pregnant women varied both in concentration and total amount excreted per twenty-four hours. Marked diurnal variations were found, and a larger total amount excreted during the day than night. Variations were not only found in different individuals, but the same patient excreted varying quantities on different

days. Neither the P_{H_2} , nor presence of albumin had any relation to the amount of amylase present. No characteristic change was noted in such complications as cystitis, pyelitis, acute endometritis, acute mastitis, nor in mild thyrotoxicosis.

The ferment was found to be in larger amounts in concentrated specimens, but even in those of large volume, in which the amylase was diluted, the concentration was equal or greater than that found in the blood. It is evident that the excretion of amylase by the kidneys plays some part in the regulation of the constant blood levels. If the kidney function is normal, the ferment is always present. When severe kidney damage exists, with a marked loss of secretory tissue the elimination of amylase is impaired and the concentration in the blood rises. This is illustrated by two cases, one with contracted granular kidneys, and the other with multiple renal infarcts. The amylase apparently leaks through in acute nephritis, however, as no rise was found in the blood of such a case.

If, on the other hand, the amount of amylase entering the blood is actually increased and the kidneys normal,* a tremendous increase is found in the urine. If an amount above normal is demonstrated in the blood, then the rate of entrance to the blood stream must be greater than the rate of excretion of the excess, and it would seem that the kidneys have an upper threshold at which they function efficiently to help maintain a normal blood level. Any increased rate of excretion that they may compensate for, under pressure, is not of the same progression as that within the limits of normal, unless there be some reaction to prevent its excretion when present in a large amount, should this quantity be of physiologic importance.

The existence of an antiferment is fairly well disproved, so it is not likely that any process of conservation would take place. However, according to Sherman¹⁶ and Caldwell,¹⁷ most amino acids conserve amylase from hydrolytic destruction, and increase its activity. They believe the ferment itself to be of a protein nature, or contain protein as an integral constituent.

In preeclampsia low blood values were not uncommon, with a gradual rise toward normal after termination of the pregnancy. The duration of toxic symptoms seemed to be of more importance than the immediate severity. The urine values fell within wide variations, but if considered as a group the general average fell below that for a corresponding group of normal cases. This is to be expected since a lower blood value necessarily would diminish the excretion. The same findings occurred in eclampsia, with even lower values, except in one case that developed rather suddenly. Kidney damage apparently was not severe enough in any of these cases to cause any block in amylase excretion. In such complications the blood contains less of the ferment than normal, so there

*This was seen in some cases of vomiting in pregnancy not reported at this time, and in certain pancreatic conditions.

must be a decreased amount entering the blood stream. This impairment may be explained on a basis of vascular changes in the pancreas. After termination of the pregnancy, there is some gradual readjustment that allows a slow return of the blood amylase toward normal.

Whether or not the pancreas takes any part in these toxemias of pregnancy has neither been proved nor disproved, but there are certain changes that take place in the amylase content of the blood in these conditions. It does not seem that amylase determinations are of any great diagnostic or prognostic value, but have some importance in an investigative study of these toxemias. The amylase values will be altered by the kidneys only when there is severe loss of renal function, which causes some impairment of amylase excretion.

CONCLUSIONS

1. Normal pregnancy has no effect upon the blood amylase, which remains between 4 to 7 units per c.c., which is comparable to the limits previously found in the nonpregnant individual.

2. The urine shows such wide variations both in concentration of units and total amount excreted in twenty-four hours that no normal figure can be given.

3. A slight rise may occur in the blood during labor if the process is long and difficult.

4. The excretion of amylase by the kidneys is not impaired unless there is considerable loss of secretory tissue.

5. In the cases of toxemia of pregnancy with a hypertension that were examined, 35 per cent of the determinations showed a blood amylase value distinctly below normal.

We wish to express our appreciation to Dr. W. J. Dieckmann, and Dr. F. P. McNalley for their aid and interest in this work.

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BLOOD CHEMISTRY STUDY IN NORMAL PREGNANCY AND ECLAMPTOGENIC TOXEMIA*

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THE various changes in the chemistry of the blood during pregnancy have attracted the attention of numerous investigators, since a knowledge of such changes might be of considerable importance in establishing an early diagnosis of the more serious complications of pregnancy.

Folin¹ in 1917, in an analysis of 100 cases, reported that the nonprotein nitrogen is seldom over 30 mg. per 100 c.c. of blood and that the urea nitrogen represents from 20 to 35 per cent of the nonprotein nitrogen. These findings were corroborated by Caldwell and Lyle² in 1921.

Slemons,³ a year later, reported that when pregnancy is complicated by pre-eclamptic toxemia, the nonprotein nitrogen is normal and is frequently increased as soon as convulsions occur.

In 1921, Killian and Sherwin⁴ reported low values for nonprotein nitrogen and urea nitrogen in normal pregnancy, the urea nitrogen constituting about 44 per cent of the non-protein nitrogen. They found no variation in the uric acid, creatinin, chloride, or sugar concentration of the blood of normal pregnant women as compared to that of nonpregnant women. In nephritic toxemia they found an increase in non-protein nitrogen of which 50 per cent was in the form of urea nitrogen. They also report a definite increase in uric acid in this condition.

In 1924, Stander⁵ reported that in normal pregnancy, the nonprotein nitrogen, as well as the urea nitrogen, is less than in the nonpregnant woman, the average being 28 and 12.48 mg. per 100 c.c. of blood respectively. The uric acid content is about the same as in the nonpregnant woman. The nonprotein nitrogen is increased in nephritic toxemia and the uric acid content of the blood is definitely elevated in all three types of toxemia, nephritic, preeclamptic and eclamptic.

Stander,⁶ in 1929, reported that in the majority of cases of eclampsia, there is a tendency toward hyperglycemia and that following the convulsions there is a slight rise in blood sugar.

Titus,⁷ in 1929, contrary to the findings of Stander, reported wide fluctuations in blood sugar values during eclampsia and noted that the convulsions are almost invariably preceded by a sharp fall in blood sugar.

It is of interest to note that most of these investigators concerned themselves chiefly with the nitrogenous constituents of the blood using different groups of cases for the different periods of pregnancy without following these changes in the same individual throughout the entire period of gestation. The present investigation was, therefore, undertaken to determine the changes in nonprotein nitrogen, urea nitrogen, creatinin, uric acid, sugar and chloride content of the blood throughout the entire period of gestation in the same individual.

With this in view, a study was made of ten cases of normal pregnancy, twenty cases of preeclamptic toxemia, five cases of eclampsia and five

*Read before the Chicago Gynecological Society, June 19, 1931.

eases of nephritic toxemia, and the results were compared with a similar analysis of ten cases of normal nonpregnant women used as controls. Examinations were made upon patients from clinics of the Illinois Research and Cook County Hospitals. In the cases of normal pregnancy, blood examinations were made at intervals of 3, 5, 7, 8 and 9 months and first, third, fifth and ninth day puerperium and at six weeks after delivery. In the cases of preeclamptic toxemia, eclampsia and nephritic toxemia, two readings were taken before delivery and the same number of readings after delivery as for normal cases.

METHODS

In all cases, the blood samples were taken in the morning before breakfast. Potassium oxalate was used as an anticoagulant. The nonprotein nitrogen was determined by Koch-McMeekin's method,⁸ urea nitrogen by Marshall's modified method, sugar⁹ and uric acid¹⁰ by Folin's method, creatinin by Folin and Denis'¹¹ method, and chlorides by Whitehorn's method.¹²

ANALYSIS OF RESULTS

Referring to Table I, which includes the average for the series of ten cases of normal pregnancy, it can be seen that the nonprotein nitrogen increases as pregnancy advances from 24 in the third month to 35.27 in the ninth month. The urea nitrogen also increases from 8.73 to 14.71 during that same period. Uric acid increases from 1.96 in the third

TABLE I. AVERAGE FOR SERIES OF NORMAL PREGNANCIES

DURATION OF PREGNANCY	N.P.N.	UREA N.	CREATININ	URIC ACID	SUGAR	CHLORIDES
3 months	24.434	8.7364	1.128	1.962	84.285	449.9
5 months	28.101	10.4844	1.189	2.382	79.615	447.5
7 months	31.82	10.04312	1.161	3.26	75.88	459.6
8 months	33.93	14.2377	1.16	3.62	69.82	454.8
9 months	35.27	14.71	1.194	4.15	70.47	444.8
1st day p.p.	29.54	14.17	1.28	3.04	79.46	450.4
3rd day p.p.	29.42	15.364	1.23	3.06	82.23	459.4
5th day p.p.	29.72	14.66	1.24	2.83	88.68	456.0
9th day p.p.	32.29	16.31	1.16	3.05	91.61	456.2
6 weeks	31.397	15.395	1.339	2.43	95.58	461.13

month to 4.15 in the ninth month, the latter figure representing a slight increase over that found in normal nonpregnant women. Creatinin and chlorides do not show any variation. Sugar decreases with the advancement of pregnancy from 84.2 in the third month to 70.47 in the ninth month.

Table II shows that in preeclamptic toxemia the nonprotein nitrogen varies from 21.69 to 33.97, the average being 29.39. The urea nitrogen was found to vary from 8.85 to 26.56 with an average of 16.06. The averages for uric acid and sugar were 3.23 and 78.41, respectively. It is,

therefore, seen that the findings in preeclamptic toxemia do not differ to any appreciable degree from those found in normal pregnancy. It is furthermore significant that these figures returned to normal six weeks after delivery.

The figures obtained in eclampsia and nephritic toxemia are formulated in Table III. In the former, the nonprotein nitrogen varied from

TABLE II. PREECLAMPTIC TOXEMIA

CASE NO.	N.P.N.	UREA N.	CREATININ	URIC ACID	SUGAR	CHLORIDES	REMARKS
6	27.07	17.242	.86	2.50	82.78	418.5	
9	28.35	14.445	1.18	2.30	79.49	418.72	One kidney present Porro Cesarean
10	30.00	8.854	1.18	3.61	75.47	449.24	
39	29.51	17.242	1.42	1.90	72.30	470	Cesarean Section
18	30.00	16.776	1.69	3.63	75.01	462	
19	28.57	8.854	1.40	2.22	81.63	478	Normal delivery
20	25.53	9.320	1.30	1.76	72.30	466	Normal delivery
21	29.04	13.866	1.05	4.06	97.56	440	Porro Cesarean
23	33.97		1.43	2.70	71.02	450	Edema B.P. 200/130 Normal delivery
25	23.38	6.8036	1.07	2.18	89.56	466	B.P. 170/120 Edema
28	33.65	26.562	1.42	4.61	70.59	466	Normal delivery
29	37.90	20.6904	1.16	4.18	78.95	440	Normal delivery
31	21.69	17.8012	1.80	2.35	98.37	450	B.P. 166/100
32	25.35	17.708	1.28	2.59	83.33	470	Mitral Regurg.
33	25.90	20.504	1.01	2.62	76.92	456	
34	33.65	24.232	1.28	3.13	64.18	450	B.P. 150/90
35	42.30	23.30	1.25	5.21	87.60	450	Cesarean Section
36	31.86	15.378	1.69	7.20	73.17	468	
37	23.84	13.514	1.40	3.05	66.66	452	B.P. 170/110 Forceps delivery
38	26.43	12.116	1.63	2.97	71.42	442	Normal delivery
Average	29.399	16.06		3.238	78.415		

TABLE III. NEPHRITIC TOXEMIA

CASE NO.	N.P.N.	UREA N.	CREATININ	URIC ACID	SUGAR	CHLORIDES	REMARKS
27	45.59	26.8416	1.13	6.43	78.43	470	Cesarean Section
16	67.25	43.804	1.34	10.44	117.64	476	Macerated Fetus
7	28.57	8.481	1.28	2.60	85.72	503.78	Albuminuric Retinitis
22	43.38	19.1992	1.50	8.36	75.47	466	
30	34.62	18.64	1.69	3.05	118.83	464	Luetic Aortitis
Average	43.88	23.39		6.17	95.21		
<u>ECLAMPSIA</u>							
(Following Convulsion)							
26	33.33	17.1488	1.25	3.69	179.21	462	
24	38.70	15.611	1.40	4.61	103.46	454	3 convulsions
17	40.92	19.106	1.40	5.45	184.35	460	Macerated Fetus
40	64.30	34.62	2.19	10.21	148.10	468	Forceps Delivery
(Before Convulsion)							
14	31.86	12.42	1.40	3.75	66.31	434.2	Forceps Delivery
Average	41.82	19.781		5.54	153.78		
					66.31		

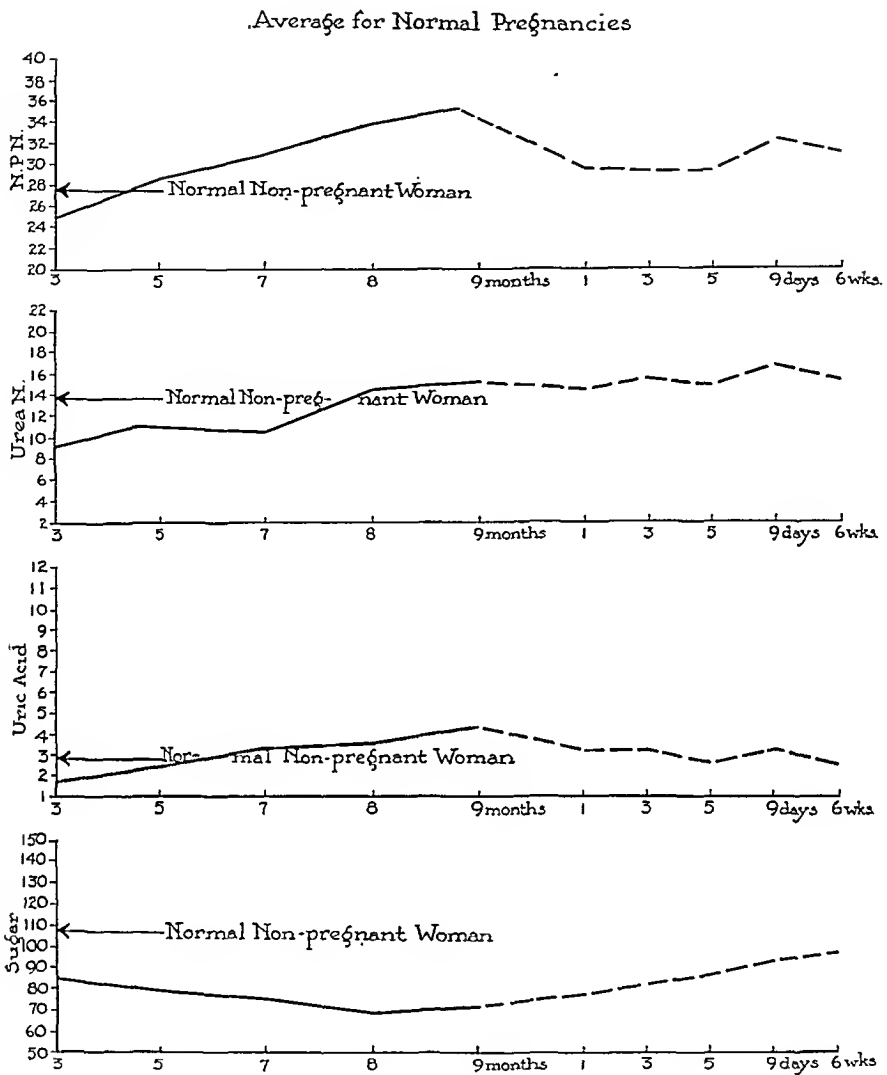


Fig. 1.

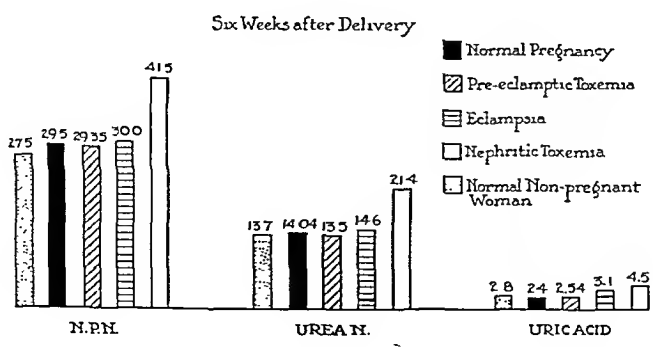


Fig. 2.

31.86 to 64.30 with an average of 41.82. Urea nitrogen varied from 12.42 to 34.62 with an average of 19.78 and the average for uric acid was 5.54. It is therefore seen that the nitrogenous elements in this condition shows an appreciable rise over the normal. A more striking difference was found in the case of sugar which rose from 66.31 before the convulsions occurred to that of 153.78 following the convulsions. Here, as in the case of preeclamptic toxemia, the blood findings were normal six weeks after delivery.

In nephritic toxemia, the nitrogenous elements show a greater increase than that found in all the above conditions, the nonprotein nitrogen, urea

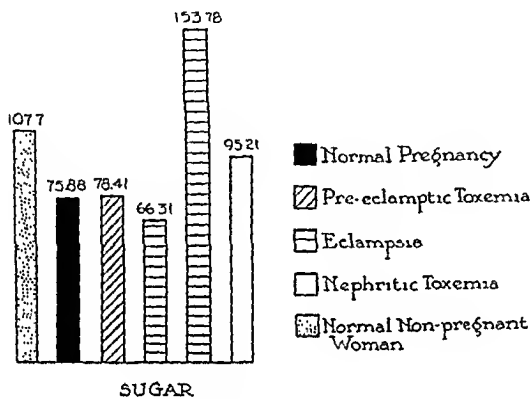


Fig. 3.

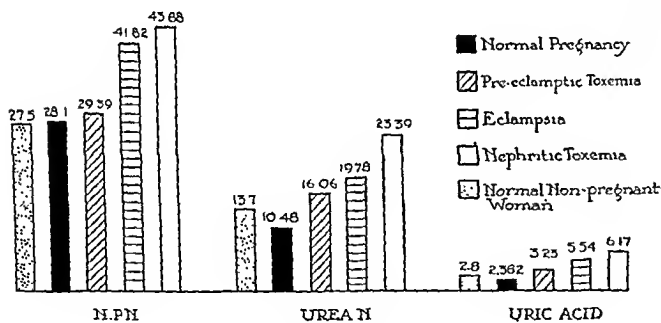


Fig. 4.

Six Weeks after Delivery

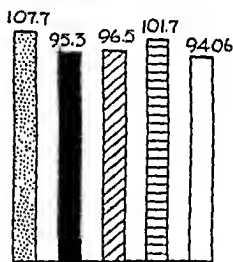


Fig. 5.

nitrogen and uric acid averages being 43.88, 23.39 and 6.17 respectively. The sugar showed little variation from the normal nonpregnant cases, the average being 95.21. But the most striking and significant difference between this condition and eclampsia lies in the fact that here the nitrogenous constituents show practically no tendency to return to normal even at the end of six weeks.

COMMENT

It was originally hoped that the results of this investigation might prove of diagnostic import in the complications of pregnancy, but inasmuch as the clinical symptoms appear before any changes in the chem-

istry are manifested, the latter offer little information as to the diagnosis; however, they play some rôle in the prognosis of these conditions, since there is an increase in the uric acid content of the blood in preeclamptic toxemia, eclampsia and nephritic toxemia and the increase in each condition is proportional to the severity of the disease.

Eclampsia is differentiated from nephritic toxemia by the fact that the increase in the nitrogenous constituents in the latter does not return to normal after six weeks. With reference to the sugar content in eclampsia, the results of this investigation, in a way, corroborate the work of Titus and also of Stander inasmuch as there was hypoglycemia immediately preceding a convulsion and a sharp rise in the sugar content immediately following a convulsion. It might be casually added that the beneficial results of glucose therapy in eclampsia obtained by Titus may justify his contention that the hypoglycemia is the underlying disturbance in that condition.

CONCLUSIONS

In summarizing the salient points of this investigation it is noted that

1. There is an increase in the nonprotein nitrogen from 24 in the third month to 35.27 in the ninth month.
2. Uric acid shows a slight increase during the ninth month of pregnancy.
3. The sugar content of the blood is diminished from 84.2 in the third month to 70.47 in the ninth month.
4. In preeclamptic toxemia, the nonprotein nitrogen, urea nitrogen, and uric acid show a slight increase over that found in normal pregnancy with a return to normal in six weeks.
5. In eclampsia, the nonprotein nitrogen, urea nitrogen, and uric acid show a greater increase than that found in preeclamptic toxemia with a similar return to normal.
6. In nephritic toxemia, the nitrogenous constituents show a more marked increase than that found in any of the conditions here considered differing from eclampsia in that they do not return to normal even at the end of six weeks after delivery.

Note: I am greatly indebted to Drs. F. H. Falls and Wm. H. Welker for their helpful guidance in this work.

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AN ANALYTIC STUDY OF 1,000 CASES OF CESAREAN SECTION
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CESAREAN section is apparently on the increase; the reasons for this are numerous. Improved technic and a more thorough knowledge of the conditions under which a cesarean may be performed have greatly reduced the initial risk. Today, operation is preferred to the hazard of fetal injury or severe maternal damage. Better obstetric teaching has resulted in a more general recognition of cephalopelvic disproportion. On the other hand, cesarean sections are performed in the presence of real or only apparent dystocia, in preference to delivery by some more legitimate procedure. Reduction in the mortality rate in the last decade is lessening the hazard in the minds of physicians, and this, we believe, is increasing the incidence of cesarean operation beyond the rational limits of scientific obstetrics. There is, moreover, the ever-present problem of the reoperative cesarean in those who have once been delivered by this route.

Notwithstanding many improvements, the mortality in cesarean section is still high. This is especially true in certain sections of the country and among certain groups of operators. The classical operation has always been and is still the most popular procedure. It is the oldest, the simplest in point of technic and is the only type attempted by many operators. Other approaches, such as the extraperitoneal cesarean, the Porro, the Portes operation, are performed only under unusual conditions, and, with the possible but improbable exception of the extraperitoneal, none are likely to become standard procedures.

The present paper is based upon a complete study of 1,000 cases drawn from a consecutive unselected series of 1,257 performed by all operators at the Robinson Memorial* from January 1, 1911, to February 1, 1931. The deletion of 257 cases in the series was due chiefly to the inaccessibility of certain of the earlier records and to those cases where the individual operation was of some special type, such as vaginal section, the total number of which was too few to warrant statistical comparison. For purpose of contrast we have divided the whole period into two parts; namely, 1911 to 1919, inclusive, and from 1920 to 1931. This division enables us to compare two approximately equal periods, during the first of which the classical operation was practically the only operation performed, while in the second the low cervical operation was first instituted and has gradually superseded the old procedure.

During this period (January 1, 1911, to February 1, 1931) there were a total number of 31,613 confinements. The out-patient deliveries, num-

*The maternity department of the Massachusetts Memorial Hospitals.

bering 3,038 are obviously included in our list because all operative cases encountered in the district are sent into the house for delivery. The statistical data are given in Table I.

TABLE I. SUMMARY OF TOTAL CONFINEMENTS AND MATERNAL DEATHS

YEAR	CONFINEMENTS			MATERNAL DEATHS	
	House	Out-patient	Total	Number	Per Cent
1911-1915	4449	1163	5612		Omitted as data incomplete
1916-1919	6409	729	7138	82	0.90% to 1.33% Av. = 1.15%
1920-1931*	17717	1146	18863	190	0.39% to 1.54% Av. = 1.01% Av. 1927-31 = 0.97%
Total	28575	3038	31613	272	Av. 1916-31 = 1.05%

*Up to Feb. 1, 1931.

But few comments are necessary. For the period containing dependable records maternal deaths fluctuate within narrow limits about 1 per cent, the number being 272 in a total number of confinements of 26,001, or 1.05 per cent.

A primary analysis of the fundamental data as relating to the cesarean operations can best be presented in graphic form (Chart 1).

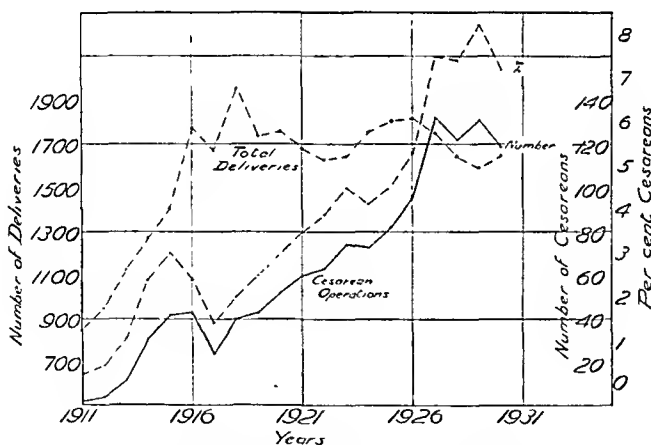


Chart 1.—Relation of cesarean section to total deliveries.

During the first portion of the period, the number of deliveries shows a steady increase, but has remained at a fairly constant level, determined by the hospital capacity, since 1916. The cesarean operations have increased steadily in number from 2 in 1911 to 131 in 1929. The figures for 1931 are omitted, since only January is considered, but 12 cesareans were performed in 130 deliveries, or 9.2 per cent. The influence of the low operation is manifest both in the absolute increase and in the more pronounced upward trend of the percentage curve in the years following its introduction.

Of the 1,000 cases, 624 were abdominal sections; this includes a few transperitoneal as well as the usual extraperitoneal type of procedure

and one case of abdominal pregnancy; the remaining 376 were laparotomies. The Porro operation was performed seven times. Several attempts were made to induce labor in the single case of abdominal pregnancy, and the radiogram showed a fetus apparently in utero, at full term, with the head at the pelvic brim.*

Two hundred seventy-seven of the patients had had at least one previous cesarean. The maternal mortality in the cases having cesarean section was 54 with a fetal mortality of 89. While the death rate of the infants seems unduly high, it must be remembered that many of the babies were premature and in one instance, under the age of viability, the section being performed in the interest of the mother. This will be considered in detail in a subsequent table.

The maternal mortality and the analysis of the results of the two types of cesarean operation can be presented most compactly in tabular form.

TABLE II. MATERNAL MORTALITY STATISTICS

YEAR	TOTAL CESAREAN OPERATIONS	CLASSICAL OPERATIONS			LAPAROTRACHELOTOMIES		
		SURVIVED	DIED	TOTAL	SURVIVED	DIED	TOTAL
1911	2	2	0	2	Operation not performed during this period.		
1912	1	1	0	1			
1913	15	13	2	15			
1914	31	26	3	29			
1915	42	37	2	39			
1916	43	37	5	42			
1917	24	16	4	20			
1918	40	29	0	29			
1919	43	31	6	37			
1920	52	41	2**	43	4	0	4
1921	60	37	2	39	2	0	2
1922	63	52	5	57	1	0	1
1923	74	65	7	72	9	1	10
1924	73	43	3	46	6	0	6
1925	82	40	1	41	22	0	22
1926	96	27	1	28	34	0	34
1927	132	35	3	38	74	1	75
1928	122	4	0	4	43	0	43
1929	131	14	1	15	79	1	80
1930	119	24	2	26	86	2	88
1931*	12	1	0	1	11	0	11
Totals	1257	575	49	624	371	5	376

*Only month of January.

**Includes case of abdominal pregnancy.

The discrepancies in the table between the record of total cesareans and the sum of the classical and laparotomies cases are due primarily to the incompleteness of the records noted in the body of the paper. A second and minor factor comes from the omission of a number of operative deliveries by routes other than the two considered in this paper.

Inspection of these data shows some significant relationships. From

*The surgeon's quotation is as follows: "A dead baby was found in the abdominal cavity with the head lying in the pelvic cavity. The uterus was found twice normal size and contained a fibroid projecting from the left cornu—the placenta was attached to the mesentery—the cord was tied and the baby extracted—the fibroid removed and the placenta left in the abdominal cavity."

1911 to 1919, inclusive, there were 214 abdominal sections with a maternal mortality of 22, or 10.2 per cent. During the next period, 1920-1931, the classical operation was performed on 409 patients with a total of 26* maternal deaths, or 6.4 per cent. The first laparotrachelotomy was performed in 1920, and during the period since that time a total of 376 "two flap" operations have been performed. This series shows only 5 maternal deaths, or 1.33 per cent. These figures obviously contrast most favorably with those from the series of classical operations.

In comparing the end-results of the two methods of approach, a series of other considerations are worthy of attention. Added factors before, during, and after delivery all may play some part in determining the outcome and a few of these may be briefly reviewed.

TRIAL LABOR

Sections were performed on 285 cases, or approximately 25 per cent, which were known to have had trial labors. The extent of labor specified in hours varied from one to 120. The greatest number of cases (60) had from six to ten hours' labor, although almost as many (52) had five hours or less. There was a total of 20 deaths, a percentage of 7.07 per cent. Eighty-five cases in the series had labor terminated by classical section, while 200 had laparotrachelotomies. Of the deaths, 17 occurred in the brief series of 85 patients with classical operations (20.0 per cent) while in the much larger group with the low operation, only 3, or 1.5 per cent died.

ADDITIONAL OPERATIONS

About one-third of the entire series (327) had some other operation performed at the time of the section. Of minor statistical import are records of one posterior gastroenterostomy, two umbilical herniotomies,

TABLE III. INDICATIONS FOR STERILIZATION

CONDITION	NUMBER	TOTAL
Previous Cesarean (one to four)	120	120
Earlier Pregnancies (three to ten)	23	
Mental	2	
Cardiac	23	
Constitutional	17	
Structural	16	
Toxemias	9	
Imbecile Children	2	92
Cause not given		41
	Total	253

five myomectomies and seven (Porro) hysterectomies. Fifty-nine of the patients had appendectomies with a record of one maternal death in the group. By far the most common operation was that of sterilization, 253 of the patients, or 77 per cent of this group, being manipulated for this purpose. A record of earlier cesareans was the indication of most frequent report for sterilizing operations but certain others ap-

*Excluding case of abdominal pregnancy.

peared in significant numbers. A summary of reported causes is given in Table III.

FETAL POSITION

This was recorded in about three-fourths of the cases and the principal divisions are recorded as a matter of possible interest.

TABLE IV.

POSITION	NUMBER	
R.O.P.	239	
L.O.P.	94	
L.O.A.	209	
R.O.A.	103	
Breech	92	
Posterior (unclass.)	10	
Transverse	17	
Face	4	768
Not specified		232
	Total	1000

A fact of interest relative to fetal positions may be noted. Out of 768 cases classified almost one-half had posterior positions. Probably this single factor was important in helping to determine the type of delivery in such cases.

DRAINAGE

This topic is included because of interest during the first period in the efficacy of drains and saline flushes. There were 17 deaths in 127 cases. During the second period there was no record of saline flushing of the abdominal cavity. With this latter procedure there were 8 maternal deaths in 68 cases, a mortality of 11.7 per cent. The use of drains was even less successful, 59 cases being reported with nine deaths, or 15.3 per cent mortality.

MORBIDITY

For purposes of emphasis we have considered every elevation of temperature over 100° F. during the patient's stay in the hospital as morbidity, even though it be recorded but once on the chart. This is, of course, an unwarrantably rigorous standard for any general con-

TABLE V.

TEMPERATURE	CLASSICAL OPERATION		LAPAROTRACHELOTOMIES	
	No.	%	No.	%
No elevation	42	6.7	245	65.2
100 - 101	128	20.5	117	31.1
101 - 102	225	36.1	12	3.2
102 - 102.5	144	23.1		
102.5 - 103	44	7.0	2	0.5
103 - 106	41	6.6		

on. In the present instance, in which comparison between the operative routes is the thesis, the relative values are so strikingly initiated that this rigorous standard has seemed admissible. For the purpose of comparison the morbidity has been classified separately and the results are given in Table V.

That out of a total of 624 classical sections (includes ease of normal pregnancy) only 42 cases had no elevation in temperature, or 6.7 per cent. Compare this with the laparotrachelotomies, which numbered 376 and among which 245 had no elevation in temperature, or 65 per cent. This is a tremendous difference in the morbidity rate, although approximately four times as many laparotrachelotomies had no fever. A still more striking comparison is found in the relative frequency of 229 classical operations after which there resulted temperature of 102° and higher as compared with only two cases in a similar group among the laparotrachelotomies.

Causative factors for morbidity as reported, included 35 different sources. Wound infections (78), other infections (79), and disorders of the respiratory (77), cardiorenal (88), gastrointestinal (11) and genitourinary system (32) accounted for practically all of the 370 cases with complete records. The records of the remaining 343 assigned no definite reason and in the majority of cases morbidity was no more than a local and transitory result of the surgical manipulation.

Wound infections constituted the largest single group. Among other things those of the respiratory system 20 cases of bronchopneumonia, influenza, and 10 of pleurisy are the most significant. There were 12 cases of pyelitis with 15 of pyelonephritis, and 13 of chronic nephritis. Fifteen abscesses were reported, while inflammatory processes of the perimetrium accounted for 17 cases. There were 14 cases of peritonitis, 14 of mastitis, and 6 of phlebitis. In the circulatory group there were 12 patients with septicemia, secondary anemia and sapremia being included in the remainder.

INDICATIONS

The classification of indications is somewhat difficult, in view of the variety of reasons which have been given. Since 1920, the majority of the operations have been decided and performed by the gynecologists on the staff; during this period the accepted conditions have been practically limited to (a) cephalopelvic disproportions, (b) cesareans, (c) antepartum bleeding, and (d) toxemias. Generally speaking, the classification of indications as outlined by Holland¹ and modified by Hodge² have been adopted with such modifications as are explained under the proper headings. Each will be briefly discussed.

Contracted Pelvis.—Under this indication a total of 347 operations were performed, with a maternal mortality of 12, or 3.45 per cent. This group includes one case of abdominal pregnancy. Only such records were included in this group as gave contracted pelvis as an indication for

section; others which may be listed as "previous cesarean" may also have had contracted pelvis.

Classical sections were performed on 214 patients, or 61.7 per cent as compared with 133 patients which had laparotrachelotomies, or 38.3 per cent. The maternal mortality is very striking. Ten women (4.67 per cent) died following classical sections as compared with 2 deaths (1.50 per cent) following the low cervical operation. The baby deaths require no comment beyond the slightly lower mortality in the two flap operation (3.3 per cent and 2.3 per cent).

2. *Toxemias*.—This is a difficult group for distinct and separate subdivision. Williams lists the following: (a) pernicious vomiting, (b) acute yellow atrophy of liver, (c) nephritic toxemia, (d) preeclamptic, (e) eclamptic, (f) presumable toxemia. In our group, the first period of our report (1911-1920), nephritic toxemias as well as presumable toxemias were common indications for section; in this same period cesareans were performed more frequently on cases of eclampsia, where the patient had convulsions before delivery.

The 78 cases which comprise this group, may be divided as follows: (A) Eclampsia, 8 cases; (B) preeclampsia, 14 cases; (C) nephritic toxemias, 56 cases.

A. *Eclampsia*.—In this group 7 cases had classical sections with 3 deaths and 1, a successful laparotrachelotomy. The maternal mortality is indeed high. The fetal mortality was 50 per cent; prematurity, however, accounted for half of this mortality.

B. *Preeclampsia*.—These 14 cases were equally divided, the single death falling in the classical series. The fetal mortality was confined to the group with laparotrachelotomies with one full-term and two premature deliveries.

C. *Nephritic Toxemias*.—This group has a total of 56 cases. Forty-five cases had classical sections, seven of which, or 15.6 per cent died. Ten cases had laparotrachelotomies with one death. In this group there were included two cases of albuminuria, without other toxemie symptoms, three cases of acute nephritis, one case of uremia with convulsions, and one case of hypertension. There were 5 fetal deaths, one full-term and four premature deliveries all in the classical group.

3. *Antepartum Hemorrhage*.—Serious antepartum hemorrhage is a very grave complication of pregnancy. The trend today is to turn without hesitation to cesarean section for this complication.

Accidental hemorrhage and placenta previa comprise the group. There were ten cases of the former with one maternal death and 43 cases of the latter with 3 deaths. All of these deaths were patients sent into the hospital *in extremis*, and on whom attempts at delivery per vaginam had been made before admission.

The question of doing cesarean sections in infected cases of placenta previa has been discussed many times. Most writers feel that the operation should be confined to clean cases. We feel that with the advent

of the laparotrachelotomy we should not fear to perform a section in infected cases also. Uterine wounds are the source of spreading infection to the peritoneal cavity, but with the laparotrachelotomy the chances are much less than with the classical section.

(a) *Placenta Previa*.—Forty-three cases comprise this group. The 3 deaths all occurred in the classical group of 31 cases; in addition there were 12 survivals with the low operation. The total maternal mortality was 6.9 per cent. There were no deaths in cases which were admitted to the hospital without previous attempt at delivery. Of the 12 cases which had laparotrachelotomies, 2 cases were frankly infected and it is interesting to note that both survived. We feel that the low cervical operation is the elective choice in such cases.

The fetal mortality was 20.5 per cent. This includes one nonviable fetus and 5 prematures. Deducting these 6 deaths, the net fetal mortality was 6.8 per cent, all in the classical group.

(b) *Accidental Hemorrhage*.—In all instances of fetal mortality (60 per cent) the heart sounds were not obtained before operation. In the one case of maternal death the patient was admitted into the hospital *in extremis*. The 2 cases of laparotrachelotomies were infected before admission to the hospital: with this fact the choice of cesarean operation was the newer method. Again it is interesting to note that both cases made uneventful recoveries.

4. *Heart Disease*.—It is at this point that we make a modification in the grouping of indications, as outlined by Holland and by Gordon in their articles using separate classifications for heart disease and for previous cesareans.

There was a total of 24 cases of heart disease. The majority of these cases (18) were primiparae. Classical sections were performed in 22 cases with four maternal deaths. Two cases had laparotrachelotomies with no fatality. The total maternal mortality was 16.6 per cent. The fetal mortality was confined to 1 full-time and 3 premature infants in the classical group.

5. *Previous Cesareans*.—Under this indication are included four cases of ruptured uterus. There was a total of 277 previous cesareans.

176	had one previous cesarean
69	had two previous cesareans
31	had three previous cesareans
1	had four previous cesareans

There were seven maternal deaths among 156 classical sections performed, a percentage of 4.5. There were no maternal deaths among 121 laparotrachelotomies. The fetal mortality statistics show 17 full-term and 7 premature infants in the classical group and three each in the low operation series.

6. *Unengaged Head*.—Fifty-four cases comprise this group. Probably a large number of these cases could be listed under the indication

of contracted pelvis, but unengaged head was given as indication. The 3 maternal deaths were all in the 34 patients operated upon by the classical route; the remaining 20 patients having low operations all survived. Only one full-term and one premature infant died in the first series; none in the second.

7. *Pelvic Pathology.*—This group includes the cases which had gynecologic conditions as indications for operation: thus the existing pathology was the disturbing factor either before or during labor.

Twenty-six cases had had previous operations, which were divided as follows: five cases, an anterior and posterior colporrhaphy with amputation of the cervix; twelve cases, a uterine suspension; two, a repair of the cervix; one, lysis of adhesions; three, previous abdominal operations; and three perineorrhaphies.

Twelve cases of fibromyomata uteri had classical sections without maternal or fetal mortality.

One case of dermoid cyst had a classical section performed, without maternal or fetal mortality.

There were two cases of umbilical hernia, one of which had a classical operation while the other had the newer procedure. Both were successful.

8. *Miscellaneous Conditions.*—This classification is obviously a difficult one. The plan adopted is similar in some respects to that of Gordon. The data can be presented most compactly in tabular form (Table VI).

TABLE VI.

CONDITION	MATERNAL				FETAL DEATHS			
	Class. No.	Died	L.-T. No.	Died	Class. Term Prem.	L.-T. Term Prem.		
Contraction ring	1	0	0	0	0	0	0	0
Dystocia: rigidity of cervix	5	1	5	0	0	0	0	0
Congenital malformations	2	0	1	0	0	0	0	0
Grave maternal diseases	7	0	4	0	1	0	0	0
The fetus	16	2	3	0	2	0	0	0
Rupture of the uterus	3	3	0	0	2	1	0	0
Accidents in prenatal period	1	0	1	0	0	0	0	0
Miscellaneous	35	2	42	2	4	1	0	1
Total	70	8	56	2	9	2	0	1

TABLE VII. SUMMARY

MAJOR CONDITION	PERCENTAGE OF GROUP	MORTALITY PERCENTAGE	
		CLASSICAL	LAPAROTRACHELOTOMIES
Contracted Pelvis	34.7	4.7	1.5
Toxemia	7.8	18.6	5.3
Hemorrhage	5.3	10.3	0
Heart	2.4	18.1	0
Previous Cesarean	27.7	4.5	0
Head Presentation	5.4	8.8	0
Pelvic Pathology	4.1	6.9	0
Miscellaneous	12.6	11.4	3.6
Total Mortality		7.81	1.33

DISCUSSION

The main facts elicited in this analysis are presented in tabular form (Table VII).

Contracted pelvis, the indication in over one-third of the entire group, is a structural condition of local import only as determining operation. True, it may have arisen through earlier metabolic disturbance, but any such influence cannot be regarded as immediately operative in a woman who is completing a normal pregnancy. The comparative data are the more significant in this condition because of its character; mortality is over three times as great in the classical as in the newer procedure.

Toxemias are general systemic conditions and in this group the laparotrachelotomy records its highest mortality. These deaths are to be ascribed more to the grave disease state than to the operative hazard. Again it is significant that the older operation shows more than three times as many deaths. This is susceptible of interpretation as the effect of the operation superimposed upon the constitutional state.

In the highly varied group constituting one-eighth of the series, again we find a greatly augmented mortality by the older route, the ratio being substantially the same as in the two previous groups. The lack of uniformity of the underlying pathology in this scatter of cases makes comparison somewhat less authoritative; none the less the trend is unmistakable.

To complete the case for the laparotrachelotomy it is only necessary to consider the other indicating factors, nearly half of the total series, in each group of which, the older method records an appreciable mortality while the newer approach records not a single death. While the basic figures are the same as in the preceding portion of the paper, the consistency of the superiority is impressive in the more detailed approach.

SUMMARY

Analysis of 1,000 cases of cesarean section in which either the classical operation or laparotrachelotomy was performed shows that the newer procedure is greatly superior in its lower mortality (1:5), its lessened unfavorable response to trial labor (1:13), and the much lower frequency of postoperative morbidity (1:10). Where anatomic consideration or time factor does not necessitate reversion to the classical procedure, laparotrachelotomy is clearly the method of election.

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587 BEACON STREET.

THE RELATION OF AMENORRHEA ACCOMPANIED BY GENITAL HYPOPLASIA TO THE FOLLICULAR HORMONE IN THE URINE*

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THE treatment of amenorrhea especially when accompanied by some degree of genital hypoplasia has, in our hands, rarely yielded any cures. The treatment consisted of the injection of one cubic centimeter of Sistomensin† once or twice a week, and the administration by mouth of 6 c.e. per day of a raw extract of the whole ovary,‡ as well as 6 c.e. per day of a raw extract of anterior pituitary.

In addition, almost all of the patients received a weekly intramuscular injection of 10 to 20 c.e. of blood§ taken from patients in the last half of pregnancy. In many cases the treatment was persisted in for more than a year without any results, in an occasional case a slight uterine hemorrhage of a day's duration occurred which symptomatically did not resemble a true menstrual period.

It has been determined by other investigators^{1, 3, 4} and by us² that there is a constant excretion of small amounts of follicular hormone in the urine of all normal women throughout their sex life, and often into the menopause.^{2, 4} (Tables I and II.) The amounts excreted vary from several mouse units (M.U.) to several rat units (R.U.) per liter of urine, one R.U. being equivalent to 6 to 12 M.U. It occurred to us that our cases of amenorrhea may already be excreting follicular hormone in the urine. To demonstrate this, twenty-four-hour samples of urine were obtained from these patients and the follicular hormone extracted according to the method of Clarke and Kurzrok.⁵ Where the patients had been treated with ovarian extracts, a period of a month was allowed to elapse without treatment before the urine was collected.

*This work is supported by a grant from the Chemical Foundation.

†The Sistomensin was furnished to us by the Ciba Company. It is an oily solution of follicular hormone containing about 5 R.U. per cubic centimeter. We found this preparation usually active when tested on standardized castrated rats. We wish to thank the Ciba Co., Inc., for their generous supply of the substance.

‡The raw ovary and anterior pituitary extracts were manufactured by the firm of L. H. Lang of New York City. The ovarian extract was usually active qualitatively, but its quantitative standardization varied within wide limits. The activity of the anterior pituitary extract was never completely determined. The material always killed the infantile mice within forty-eight hours. Some of these ovaries showed a slight stimulating tendency. The question as to the efficacy of ovarian and anterior pituitary preparations by mouth is left open.

§The injections of pregnant blood were carried out by Dr. William M. Findley. The blood was injected into our patients immediately after its withdrawal from the pregnant women. The presence of considerable quantities of follicular hormone as well as the anterior pituitary hormones in the blood of pregnant women is now well established. We shall report in the near future a series of functional disturbances of the genital tract in which this was the only form of therapy.

METHOD FOR EXTRACTION AND ASSAY OF FOLLICULAR HORMONE IN A TWENTY-FOUR-HOUR URINE SPECIMEN

The twenty-four-hour urine specimen is measured and 700 c.c. placed in a one-liter flat-bottomed flask (*A*) (Fig. 1). This is made weakly acid with acetic acid. The hormone is more easily extracted from an acid solution. The urine is then saturated with sodium chloride which decreases the solubility of ethyl acetate in the urine. The treated urine is then covered with ethyl acetate halfway up to neck of the

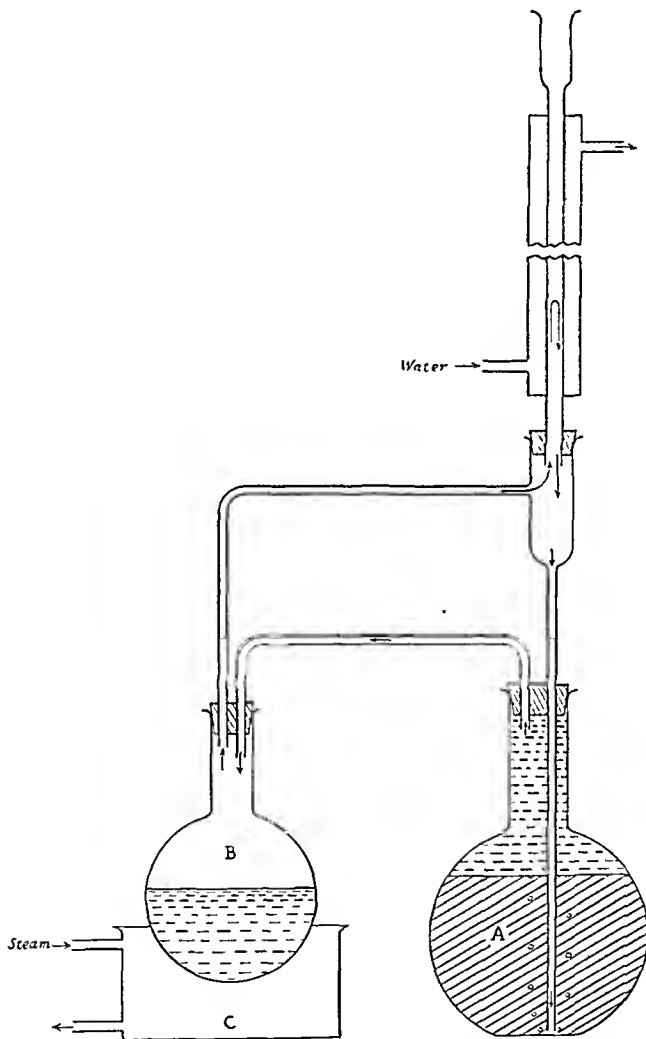


Fig. 1.—The follicular hormone extraction apparatus. The distance between the upper and lower side arms should be 3 to 4 inches. The condenser should be long, as the ethyl acetate is fairly volatile.

flask and the flask connected as shown in Fig. 1. The second flask (*B*) of 300 c.c. capacity is filled with 250 c.c. of ethyl acetate. The steam bath (*C*) is turned on and the ethyl acetate distills over through the upper side arm, is condensed and drops to the bottom of flask *A* from which it returns through the lower side arm to flask *B*. The drops of ethyl acetate in passing upwards through the urine extract the hormone. This provides continuous extraction with pure ethyl acetate. The extraction is continued for twenty-four hours. It is automatic and does not need watching. The extracted urine is then discarded, and the ethyl acetate extract, which contains the hormone, is concentrated by vacuum distillation in the apparatus il-

illustrated in Fig. 2. The distilling flask (A), 300 c.c., is filled one-third full with the ethyl acetate extract and connected with the condenser (B), a receiving flask (C), a second receiving flask (D), a trap (E) and finally an aspirator type suction pump (F). After the distilling flask has been heated in a steam bath, the suction is turned on. The remaining extract is allowed to drop into flask (A) through the thistle tube (G), which is provided with a stopcock, at about the same rate as the ethyl acetate distills over. When all the extract is finally added, it is concentrated further to about 30 or 40 c.c. and the 10 c.c. of olive oil is slowly admitted through the thistle tube as the distillation progresses. The distillation is continued until all the ethyl acetate has been removed. If bumping occurs, the suction should be reduced with the screw clamp at (H). The oil now contains the hormone originally present in the 700 c.c. of urine.

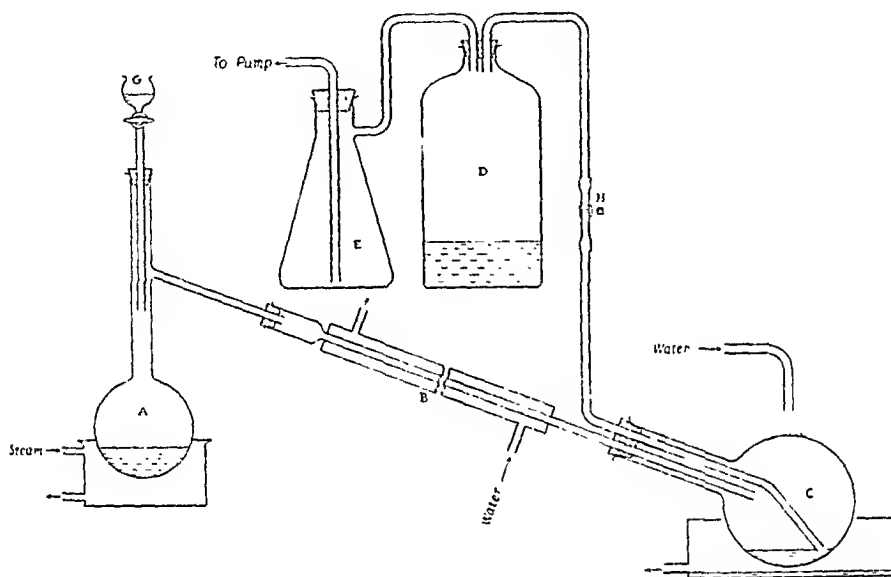


Fig. 2.—The concentration apparatus. The receiving flask (D) should be 3 to 5 liter capacity. It acts as a reservoir and is only emptied of ethyl acetate when full. Aside from removing and replacing the distilling flask, the apparatus need not be disconnected.

This 10 c.c. of oil, prepared as described above, is used for the biologic assay. Two groups of castrated rats are selected containing three animals in each group. They are injected with the oil, subcutaneously, in the back, at 9 A.M., and 5 P.M. of the first day, and 9 A.M. of the second day. Group 1 receives 0.5 c.c. of oil at each injection. Group 2 receives 0.25 c.c. of the oil at each injection. Vaginal smears are taken forty-eight, fifty-six, and seventy-two hours after first injection. A No. 13 dental spatula is very convenient for obtaining the vaginal secretion, which is then spread in a drop of saline on a glass slide. If no fewer than two animals of a group show the cornified cells characteristic of estrus, the injected material may be considered active. Mucus, leucocytes and epithelial cells must be absent to establish a positive result. The least amount of oil necessary to produce a positive smear is considered as containing one rat unit.

The hormone content of a liter of urine, expressed in terms of rat units, may be calculated from the following formula.

$$\frac{10}{y} \times \frac{1000}{700} = \text{Rat unit per liter of urine, when } y \text{ equals the total}$$

amount of oil injected into a single rat from the group receiving the smallest amount necessary to produce positive smears.

For example: If Group 1 should have positive smears and Group 2 negative smears, then there would be 9 rat units per liter of urine, while if both Groups 1 and 2 showed positive smears, there would be at least 19 rat units present. Larger amounts of hormone may be determined by using smaller quantities of oil for injection, or by making the necessary dilutions. The calculations may also be made for the total

TABLE I. FOLLICULAR HORMONE IN THE URINE IN CASES OF AMENORRHEA PLUS GENITAL HYPOPLASIA

NAME	AGE	SYMPTOMS	CLINICAL DIAGNOSIS	QUANTITATIVE ESTIMATE OF FOLLICULAR HORMONE IN ONE LITER OF URINE	RESULTS OF TREATMENT
M. H.	17	Irregular periods Amenorrhea for five months	Genital hypoplasia	17 R. U.	None
J. B.	17	Amenorrhea 14 mo.	Genital hypoplasia	8 R. U.	Had scant flow after two months' treatment
S. H.	22	Amenorrhea 18 mo.	Genital hypoplasia Froehlich Syndrome	None on first test. 9 R. U. (later)	None
A. B.	21	Amenorrhea 18 mo.	Genital hypoplasia	8 R. U.	None
C. I.	24	Amenorrhea 2 years	Genital hypoplasia Masculine stigmata	15 R. U.	None
M. K.	43	Amenorrhea 1 year. No menopause symptoms. Some genital	Some genital atrophy	10 R. U.	None
I. M.	33	Amenorrhea 1 year	Genital hypoplasia	22 R. U.	None
M. K.	26	Irregular periods Amenorrhea 6 mo.	Gained fifty pounds. Basal Metabolism +40. Negative pelvis	13 R. U.	None
A. G.	23	Infrequent periods Amenorrhea 3 mo.	Gained 125 pounds in 4 yr. Basal Metabolism, 3. Froehlich Syndrome	23 R. U.	None
L. F.	35	Amenorrhea 4 mo., preceded by amenorrhea of 2 yr.	Carcinoma of adrenal cortex. Virilism	18 R. U.	None
R. D.	21	Irregular and scanty periods. Sterility	Genital hypoplasia Male stigmata	22 R. U.	None
S. H. II.	18	Irregular and scanty periods Amenorrhea 4 mo.	Genital hypoplasia Male stigmata	9 R. U.	None
E. P.	36	Amenorrhea 10 mo.	Genital hypoplasia	18 R. U.	None

amount of urine excreted in twenty-four hours by substituting this amount in the equation in place of 1000.

The results as demonstrated by Table I show that our patients with amenorrhea excreted considerable quantities of follicular hormone, in amounts ranging from 8 to 23 R.U. per liter. The average here is slightly higher than that obtained with normally menstruating women. Such being the case, we can gain no possible advantage by the further addition

TABLE II. FOLLICULAR HORMONE IN THE URINE IN NORMAL AND OTHER CASES

NAME	AGE	SYMPTOMS	CLINICAL DIAGNOSIS	QUANTITATIVE ESTIMATE OF FOLLICULAR HORMONE IN ONE LITER OF URINE	RESULTS OF TREATMENT
R. W.	51*	Flushes, etc.	Menopause following x-ray radiation	15	No results from ovarian therapy
P. P.	30*	Very severe dysmenorrhea	Genital hypoplasia	21	No results from ovarian therapy
E. P.	32*	Flushes, sweats, etc.	Menopause following bilateral oophorectomy	0	Moderate relief from ovarian therapy
B. S.	29	None L. M. P.—4/17/31	Relaxed pelvic floor Tested, 5/14/31	11	
M. D.	31	None L. M. P.—5/18/31	Cystocele Test 5/14/31	11	
E. L.	32	None L. M. P.—4/25/31	Supravaginal hysterectomy on 1/30/31 Tested, 5/14/31	19	

*We are beginning to get the impression that only these cases of menopause are benefited by follicular hormone that are not excreting any hormone in the urine.

of 5 to 10 R.U. of follicular hormone per day. Our failure to produce a cure or even an improvement in the above cases proves the correctness of this viewpoint. The excretion of such relatively large quantities of hormone may mean that the production of the hormone is one factor and its utilization is quite another. Follicular hormone is probably not directly responsible for menstruation. The menstrual flow is to be regarded as a polyhormonal phenomenon in which the anterior pituitary and the corpus luteum hormones play important rôles. In the above cases the follicular hormone was evidently not at fault, hence its administration brought no results.

CONCLUSION

In our cases of amenorrhea accompanied by genital hypoplasia, the excretion of follicular hormone in the urine was slightly greater than

normal. Hence the administration of follicular hormone for therapeutic purposes should not, and did not, produce either a cure or an improvement in the clinical condition.

We wish to thank Professor Benjamin P. Watson for putting at our disposal the extensive clinical material of the Sloane Hospital for Women and the Vanderbilt Clinic. We greatly appreciate the help obtained from Professor Hans T. Clarke in the carrying out of the experimental part of this work.

Note: Since this paper was written, similar cases were treated with very large doses of follicular hormone with the same negative result.

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1555 GRAND CONCOURSE

THE EXCRETION OF ESTRIN DURING PREGNANCY*

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IT HAS been shown by Smith¹ that from the beginning of pregnancy to the onset of labor there is an increase in the concentration of the female sex hormone in the maternal blood. The placenta was also found by Smith to contain the female sex hormone in high concentration during the end of pregnancy. It has been demonstrated, by Frank,² in the circulating blood of gravid women as early as the sixth to the eighth week of pregnancy.

The occurrence of the female sex hormone in the follicle liquid was first reported by Frank.³ Its presence in the corpus luteum has been established by many workers, such as: Iscovesco,⁴ Frankel and Fonda,⁵ Frank and Rosenbloom,⁶ etc. Estrin has also been extracted from whole ovary, fluid from ovarian cysts, amniotic fluid, urine of pregnant women, meconium, maternal feces, maternal milk,⁷ human bile,⁸ etc.

Since estrin has been so widely found in the excretory products of the human body and in larger quantities during pregnancy, it was decided to attempt to extract it from saliva and gastric juice of pregnant women.

Samples of saliva were taken from patients, toxic and nontoxic, during different stages of pregnancy. In order to increase the quantity of saliva, the patients were given paraffin to chew. According to Morris and Jersey⁹ the act of chewing a substance such as paraffin, in addition to increasing the volume of saliva, also exerts an accelerating effect upon the process of filtration from the blood.

The following procedure was used in the extraction: To a known quantity of saliva, two volumes of 95 per cent ethyl alcohol were added. The alcohol and saliva

*This investigation was aided by a grant from the Douglas Smith Foundation of the University of Chicago. The experiments were directed by Dr. Fred L. Adair and valuable suggestions were received from Dr. Harry B. Van Dyke.

were thoroughly shaken and allowed to stand twenty-four hours. The mixture was then boiled on a steam bath for thirty minutes and filtered through cotton. The cotton and precipitate were covered with 95 per cent ethyl alcohol and again boiled for thirty minutes. The filtrates were combined and evaporated to a watery sludge under vacuum. The precipitate was extracted with ether and the ether removed by exaporation. The remaining residue was suspended in oil so that 1 c.c. of the oil suspension contained the equivalent of 50 c.c. of saliva.

The method of assay used was the vaginal smear test of Allen and Doisy.¹⁰ Three ovariectomized mature rats were used for each sample. Single subcutaneous injections were made in each case and the vaginal smears were read approximately forty hours and forty-eight hours after injection.

The samples of saliva gave the results shown in Table I.

TABLE I

TYPE OF CASE	MONTH OF PREGNANCY	VAGINAL SMEAR
Hyperemesis	1½	Negative
Hyperemesis (severe)	2½	Negative
Hyperemesis	3	Negative
Hypertension	7	Negative
Hypertension	7½	Negative
Normal	8	Negative
Normal	9	Negative

The chemical procedure and method of assay were next checked by using urine and saliva collected from the same patient. Ten patients were selected, all of them past the seventh month of pregnancy. Specimens were collected from four of them just before the onset of labor.

As is shown in Table II, the urine in all cases was positive for the presence of estrin while the saliva in all cases was negative.

TABLE II

NUMBER OF PATIENT	MONTH OF PREGNANCY	URINE ASSAY	SALIVA ASSAY
1	7 plus	Positive	Negative
2	7½	Positive	Negative
3	8	Positive	Negative
4	8 plus	Positive	Negative
5	8 plus	Positive	Negative
6	8½	Positive	Negative
7	Term	Positive	Negative
8	Term	Positive	Negative
9	Term	Positive	Negative
10	Term	Positive	Negative

A preparation of the female sex hormone, theelin, prepared according to the method of Doisy¹¹ was obtained through the courtesy of Parke, Davis and Company and an attempt was made to recover a known amount of this preparation after mixing it thoroughly with saliva. Dilu-

tions were first made of theelin, so that 1 c.c. of distilled water contained 1 rat unit, 3 rat units, 5 rat units, and 10 rat units, respectively. The dilution containing 1 rat unit to 1 c.c. of water when assayed, failed to produce a positive smear, but strongly positive smears were produced by all other dilutions.

A saliva and theelin mixture was made up, so that 1 c.c. of oil contained 3 rat units of theelin and an equivalent of 50 c.c. of saliva. When this mixture was assayed, all smears were strongly positive, showing that the female sex hormone is not destroyed by saliva.

The saliva of all cases used was alkaline to litmus paper while the urine used in every case was acid. To further check the procedure, three patients in the last month of pregnancy were given 15 grains of sodium bicarbonate three times a day for three days until their urine was strongly alkaline. Estrin was extracted from all three samples of the alkaline urine as was shown by positive smears when assayed.

A composite sample of 200 c.c. of gastric juice was collected on the fasting stomach from three patients at term. The method used in collecting the gastric juice was that of Matheson and Ammon.¹² The procedure was commenced early in the morning. A Rehfuß tube was passed and the entire gastric contents were withdrawn. One-half milligram of histamine, freshly prepared, was then given and complete aspirations were made thereafter at twenty-minute intervals. The gastric juice was subjected to the same procedure as was used in the extraction of estrin from urine and the preparation when assayed produced negative smears in all animals used.

In a recent paper Ranier¹³ states that she has found the hormone of the anterior lobe of the pituitary, the folliculin hormone, and the lutein hormone in saliva of pregnant women. She feels that they are found in equivalent amounts in saliva and urine. A reference is made in her paper to an unpublished article by Zondek in which he states that the ovarian hormone and the anterior lobe hormone are present in saliva, but they are not found in gastric juice and in cerebrospinal fluid. Ranier does not use the Allen and Doisy method of assay but uses a modification of the method used by Aschheim and Zondek in the diagnosis of pregnancy. Rats and mice were injected with an extract of saliva twice daily for three or four days and then autopsied on the sixth day. In the animals used, ripe follicles were present, and there was a definite hemorrhagic condition of the genital organs.

It would seem, however, from the results obtained by using the Allen and Doisy method that estrin is not excreted from the alimentary canal above the duodenum in large enough quantities to produce the typical hornification of the vaginal mucosa.

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THE THERAPEUTIC VALUE OF AMNIOTIN IN THE MENOPAUSE

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NO SYMPTOM complex has been more resistant to treatment and none so wrapt in obscurity from an etiologic standpoint as that group of manifestations characterized as the menopause. It is only natural that clinicians should eagerly grasp at any therapeutic agent that gives promise of assistance in the alleviation of this distressing condition.

It is known at the present time that in the ovary there are several anatomical structures that are the source of different hormones. From the follicular fluid the female sex hormone, as termed by Frank, is obtained. This estrus-producing hormone has been isolated from other sources such as the placenta or amniotic fluid. From the corpus luteum have been isolated 3 hormones, one that causes the progestational hypertrophy and a second one that aids in the embedding of the ovum. A third hormone has been described in rodents which produces a softening of the symphysis. We are acquainted with the fact, that with the cessation of the ovarian function, symptoms arise which have been termed the menopause syndrome. We do not know, however, whether these symptoms are due to the absence of the ovarian hormones per se or whether the withdrawal of these substances results in a disturbance of the ductless gland system which then causes these menopausal symptoms. It seems unlikely that the corpus luteum hormones because of their very special functions can be directly associated with the menopause symptoms and it therefore leaves as the most logical etiologic factor the withdrawal of the follicular hormone as the cause of the onset of these symptoms. However, that this is not invariably so is evidenced by the fact that in some cases of primary amenorrhea, where presumably no follicular ripening takes place, there is no menopausal syndrome.

We know that the exhibition of the female sex hormone causes in animals the symptoms of estrus. On this basis it was decided to utilize amniotin in the hope that the hormone, because of its direct action or because of its effect on the other members of the ductless gland system might be of value in the treatment of the menopause.

For a number of years at the Mount Sinai Hospital there has been in existence a special clinic in the Out-Patient Department for the investigation and treatment of this symptom complex. We are here reporting a series of 43 cases treated over a period of seven months with amniotin in suppository form and by subcutaneous or deep injections. The amniotin was made available through the kindness of Dr. Anderson of the Squibb Laboratories and we wish to express to Dr. Anderson our sincerest appreciation for his interest and cooperation.

Amniotin "Squibb" is prepared from the fetal fluid of cattle by precipitation with alcohol, acetone, and ethyl ether. The resultant oil is further extracted with alcohol and benzine and the resultant filtrate contains the amniotin which can be dissolved in water. The assay is carried out according to the technic of Doisy. The rats after the injection of the material must show fully cornified vaginal smears.

We dealt exclusively with clinic patients. They reported regularly once a week and if they received injections, at least 3 times a week. The laboratory work included blood counts, urinalysis, basal metabolism, blood pressures, and x-rays, usually of joints and sella tureica, when indicated. These examinations in the clear-cut menopause case, with the exception of x-rays of the joints were essentially negative nor were they changed with amniotin treatment. Physical examinations were also done and any abnormalities found, not attributable to the menopause, ruled out these individuals as far as our studies were concerned.

Symptoms which we carefully studied included hot flushes, sweats, headaches, joint pains, insomnia, "nervousness," and libido. The patient was studied for changes in these symptoms. This was done by careful questioning each time the patient reported. Theoretically this should be an ideal arrangement, as the impersonal relationship between doctor and patient existing in the average clinic should permit unbiased observation. However, paradoxical as it may seem, in our clinic this was not the case. The only means we had of judging improvement was the patient's word. The constant contact as well as the friendly and encouraging attitude which was taken toward the patient was distinctly detrimental to acquiring objective information. Very often the patient, due to a mistaken sense of gratitude falsely said that she felt better in spite of repeated and forceful admonition to tell the truth. Mistakes were minimized whenever possible by having written records kept of the number and frequency of symptoms in order to judge the effect of treatment from a quantitative as well as qualitative angle. We have frequently seen patients brighten perceptibly as far as the general appearance and mental attitude were concerned after a period of observation during which symptoms may have only been moderately improved. This we are inclined to attribute to contact with the doctor. As can readily be seen, the patients will tell not only symptoms but their other troubles as well, and this opportunity to relieve their minds may have

played an important part in influencing improvement. This psychic element, if we may use the term, strikes us as being exceedingly important. The fact that trouble at home, or periods of stress have resulted in an exacerbation of symptoms, where previously there has been apparently steady improvement only serves to emphasize this point.

In a previous report of a series of 25 cases treated with amniotin Sevringhaus and Allen reported satisfactory results in 14 cases, especially in those with vasomotor disturbances.

Our series comprises 43 cases. In 10 cases there was no improvement, in 22 cases there was varying improvement, and in 11 cases there was considerable improvement. In the last group of 11 cases the improvement was related to the appearance of vaginal bleeding after treatment. It is of interest to analyze the various groups so that a more rational understanding of the role played by the amniotin may be arrived at.

In the group of 10 cases showing no improvement there were 5 cases due to radiotherapeutic castration. In these, suppositories were used either alone or in combination with injections. In one instance, because of the very high blood pressure, 220/120, the patient was finally referred to the medical department. Two of these received 240 rat units as an injection dose, the other 300 rat units. Three operative cases received suppositories with no obvious improvement. In one instance the patient seemed better for about six months and then grew worse. The last two cases were natural menopause. In one the relief from amniotin was slight and transient, the symptoms aggravating under treatment which was stopped after six weeks. The second patient complained of pruritus vulvae which had resisted all treatment including x-ray. There was some atrophy of the skin but no real kraurosis. For a period of two and one-half months she received amniotin suppositories in doses as high as 160 rat units a day with no relief.

In the group of 11 cases that showed considerable improvement 10 were associated with bleeding, 1 was not. This latter case was a patient with kraurosis vulvae who, after medical treatment and x-ray, finally had a vulvectomy. The itching reoccurred after operation. She received amniotin injections over a period of two months, the dosage being as high as 200 rat units per injection 3 times a week. The improvement was steady and striking. The other 10 patients of this group that showed improvement are difficult to analyze. All these patients had temporary periods of improvement, noted either just before or during the time of vaginal bleeding. Just what role the amniotin medication played in the production of the bleeding cannot be definitely evaluated as we were unable by interrupting the treatment and resuming it to regularly cause the appearance of vaginal bleeding. This in great part is due to the fact that the patients were irregular in their attendance. However, it does seem more than coincidence that 10 of 43 patients in our series should bleed, and it is fair to conjecture that amniotin may

have precipitated vaginal bleeding by simulating menstruation in the menopausal state with at least temporary relief of symptoms. This is borne out by the work of Allen and Baker who produced menstruation in castrated monkeys using amniotin suppositories in doses approximating ours. A brief analysis of 3 of these cases may be permissible.

The first patient had a natural menopause and had a persistence of her symptoms under amniotin treatment. After being amenorrheic for six months, she had a period of bleeding with relief of symptoms. Then in spite of further treatment over a period of five months there was no recurrence of the bleeding and no alleviation of her symptoms.

The second case was an x-ray menopause. She had injections up to 120 units twice a week, improved for two months and then bled with complete relief of symptoms. Treatment was then stopped and patient remained well except for occasional flushes.

The third case was an x-ray castration. The patient had severe symptoms for one year. She received suppositories and was immediately improved. After one month of treatment she again showed improvement and bled.

It can be seen that it is difficult to determine the role played in alleviation of symptoms by the use of amniotin. The bleeding and relief of symptoms might have occurred without treatment. On the other hand the question arises whether the amniotin initiated the necessary changes that produced bleeding and so caused an improvement or whether the hormone itself was directly responsible for the improvement. It is evident that the benefit in most instances was transient.

In a group of 22 cases the improvement shown was slight in most instances and not permanent. In some, it was possible that the psychic effect of the treatment may have resulted in a temporary relief of symptoms. In some instances blank suppositories were used, but all these patients stated that they were not helped by these suppositories even though they were not aware of the fact that there was no medicament in the suppositories. However, in several instances the improvement was striking, rapid, and of long duration. One patient (22495) an x-ray castration had treatment for six weeks with amniotin with complete relief of symptoms. These recurred to be relieved again when amniotin was repeated. Another patient (22219) an operative castration had severe symptoms. She improved rapidly after one week of treatment. When the suppositories were stopped, the patient stated there was a distinct change. These cases require no detailed explanation but it can be stated that in this group of 22 cases amniotin in suppositories or injections seems to have been of some benefit. In some the relief was only temporary, ceasing when amniotin was discontinued and not improved when they again received the medication. Others showed improvement in some symptoms, particularly the flushes and sweats, while other manifestations such as headaches, joint pains and nervousness continued or increased. In still another group the symptoms improved under amniotin, to reappear when the treatment stopped and again were relieved on the resumption of treatment.

To summarize the effect of amniotin in the treatment of the menopausal syndrome, we may say that in one group of cases it seems to have influenced a return of the menstrual period with a temporary relief of symptoms; in other cases it caused a distinct alleviation of symptoms while the substance was exhibited, but the relief was not of a permanent nature. What influence the psychic effect of the treatment played is hard to evaluate. However, it is evident that the substitution of a single hormone, that is not being produced by the individual, is not sufficient to prevent entirely the symptoms of the menopause, and it is certain that other factors are included in the problem of the menopause and its associated symptoms. However, in comparison with the other therapeutic agents at this clinic, which has been in operation for seven years, amniotin is distinctly superior.

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THERAPEUTIC VALUE OF THEELIN IN THE MENOPAUSE

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THE premise that menopause symptoms are associated with a cessation of ovarian function is both reasonable and logical. As a corollary it may be stated that the loss of the dominant ovarian secretion, the female sex hormone, would appear to be a most important factor, although the increase in pituitary hormone must be taken into account. On this basis, attempts to replace this loss of female sex hormone by a substitution therapy are surely indicated. Results obtained with amniotin, biologically potent sex hormone preparation have been previously studied by us. We were led to conclude that in one group of cases it seemed to have influenced a return of the menstrual period with a temporary relief of symptoms, in other cases it caused a distinct alleviation of symptoms while the substance was exhibited, but the relief was not of a permanent nature. What influence the psychic effect of the treatment played is hard to evaluate. However, it is evident that the exhibition of a single hormone, that is not being produced by the individual, is not entirely sufficient to prevent the symptoms of the menopause, and it is certain that other factors are included in the problem of the menopause and its associated symptoms. However, in comparison with the other therapeutic agents used at our clinic, which has been in operation for seven years, amniotin proved distinctly superior.

Theelin, another excellent follicular hormone preparation, was used in the studies on the present series of cases. It represents the purest product obtainable, and assays as labelled, 50 rat units per c.c.

*Manufactured and supplied by Parke, Davis & Co., Detroit, Michigan.

The preparation was administered by intramuscular injection in increasing doses beginning with 50 rat units, three times weekly. The patients were always carefully interviewed regarding the effects of the injections in regard to exacerbation or improvement of symptoms. Before treatment complete physical examinations, blood pressure readings, complete blood counts, basal metabolism, x-rays of sella turcica and joints when indicated, and weight were recorded. The symptoms which were stressed and which were usually present were hot flushes, sweats, headaches, joint pains, insomnia, palpitation, libido, paresthesias, and psychic disturbances. The frequency of examination and administration of the material gave ample opportunity for observation of the patients. The majority were observed and treated from four to eighteen weeks, four only for three weeks and one for one week. Six cases were not strictly of the menopause type, but were included because their complaints were closely associated with menopause symptoms.

RESULTS

TABLE I. ALL CASES TREATED

CASES TREATED	TOTAL	MARKEDLY IMPROVED	SLIGHTLY IMPROVED	NO IMPROVEMENT	IMPROVED WITH BLEEDING
Menopause	25	4	9	9	3
Kraurosis	2	2			
Primary Amenorrhea	2			2	
Secondary Amenorrhea	2			1	1

TABLE II. MENOPAUSE CASES

TYPE	TOTAL	MARKEDLY IMPROVED	SLIGHTLY IF AT ALL IMPROVED	UNIMPROVED	IMPROVED WITH BLEEDING
Natural	14	4	4	3	3
Artificial	11		4	5	

COMMENT

Scrutiny of the above statistical study would appear to justify the conclusion of the existence of an efficacious hormonal preparation useful in the menopause. Certainly an improvement in 19 of 31 cases treated should be evidence of its value. Studies by other observers on this and similar preparations have almost invariably resulted in favorable reports. Where the patient's word alone is the sole means of determining improvement, and where the symptoms were almost never severe enough to incapacitate the individual, an exceedingly fine sense

of judgment must be brought into play. The correct evaluation of symptoms is so complicated that definite conclusions are difficult to draw. So many other factors enter into the patient's physical status in the menopause that it is only by unceasing and untiring effort that results worthy of attention may be arrived at.

It is insufficient to ask the patient, "How do you feel?" and to accept the reply, "Better," as evidence of improvement. The number of flushes, sweats, headaches, etc., may remain the same. The reason that the patient felt better was often found to be some happy event, good news, or improvement in her environment; in other words, improvement in her mental state which temporarily at least focussed her attention on something other than her symptoms. This mental factor is to be regarded as of prime importance. One of the greatest difficulties arose from the fact that the patients were seen so frequently and over such a long period of time. Most of them were grateful for the treatment and the interest shown, even to the point of recording improvement in order, as they thought, to please the physician. The facts were ultimately arrived at with considerable difficulty.

The nine cases reported as slightly if at all improved are of little value. For the sake of accuracy they have to be designated as improved. Actually the improvement was so slight and referred to minor symptoms, or was so transient as to really be negligible. The symptom upon which most stress was placed was the heat flash. This was the only one that could be exclusively associated with the menopause. The headaches, joint pains, palpitation, paresthesias, loss of libido, etc., brought so many other factors both physical and mental into question that they were not ranked equal in importance with the flushes. Often they had been present for years before the onset of the menopause, and here it was invariably noted that the menopause was an aggravating factor.

As far as improvement in the individual symptom is concerned, it was found that the joint pains were almost never improved, headaches rarely, sweats only with improvements in flushes; palpitation, paresthesias, and insomnia were improved more often. A return or an increase in libido was occasionally noted. As has been stated, the change in flushes was regarded as the important criterion.

It is interesting to note that the natural menopause appears more amenable to treatment than the artificial. Of the 14 cases treated (Table II) 11 were improved, 7 markedly so. Here also it was observed that in 3 of these cases the menstrual periods were reestablished with complete alleviation of symptoms. The follicular hormone probably was a factor in the production of this result, although the possibility that it may have occurred purely by coincidence must be entertained. The artificial menopause cases, either operative or x-ray castrates, were little affected. These patients showed the most severe

symptoms. really not to be compared with the relatively mild symptoms of the natural menopause.

The two kraurosis cases on whom vulvectomy had been performed showed marked improvement in the symptom complained of, "itching." This was also found to be true under amniotin treatment. Undoubtedly, supplying the follicular hormone is the important factor. The four amenorrheic cases require little comment. In three, treatment was entirely unsuccessful and the fourth bled convincingly on several different occasions with administration and withholding of the hormone.

The dosage used in the studies appeared to be ample. As much as 400 rat units per injection was given. Its constant use over a long period of time would be sufficient.

BRIEF ABSTRACT OF HISTORIES OF CASES SHOWING ANY IMPROVEMENT

CASE 1.—D. M., aged thirty-three, married. This patient had a vulvectomy in 1926, for kraurosis. Following this operation pruritis persisted. She was given twelve injections of theelin in increasing doses, with marked improvement.

CASE 2.—R. C. This patient is fifty-four years of age, married, had vulvectomy for kraurosis. Symptoms continued. She was given amniotin pessaries in April, 1930 with considerable relief. In May, 1930, her symptoms were still present for which theelin was given from May 7 to June 4 in increasing doses up to 250 rat units per injection with striking improvement.

CASE 3.—R. G., aged forty-two, married, artificial menopause (by radiotherapy) in December, 1930. Complained of frequent flushes, sweating, headaches present for a long time, joint pains in right elbow, palpitation, psychic disturbances, and insomnia. Physical examination essentially negative. Basal metabolism plus 17 per cent. Uranalysis negative. Weight 140. This patient received 9 injections of theelin in increasing doses to 250 rat units per injection from May 15 to June 8, 1931. There was slight improvement in the symptoms but these originally were very mild.

CASE 4.—A. S., aged fifty, married, natural menopause, August, 1928. Symptoms were as follows: Flushes, 20 to 30 per day, accompanied by sweats, headaches present for fifteen years, worse since menopause. Joint pains also present for fifteen to twenty years. Insomnia slight. Physical examination negative. Blood pressure 135/105. Weight 150. Uranalysis essentially negative. Basal metabolism normal. Blood count showed hemoglobin of 65 per cent and lymphocytes, 52 per cent, otherwise normal. She was treated with sedatives, at first, then thyroid with improvement. She received 14 injections, from February 19 until March 12, 1931 in increasing doses up to 150 rat units per injection. There was slight improvement.

CASE 5.—A. C., aged thirty-seven, married, artificial menopause (operated upon five years ago, 1926). Complained of flushes 20 per day, profuse sweats, headaches, joint pains in hands, palpitation, insomnia. Libido decreased. Physical examination negative. Blood pressure 140/95. Urine negative. Basal metabolism plus 6 per cent. Blood count normal, except for 50 per cent of lymphocytes. This patient received 8 injections of theelin in increasing doses up to 200 rat units per injection between April 27 and May 18, 1931. There was slight improvement in symptoms.

CASE 6.—E. B., aged forty-three, married, natural menopause January, 1930. Complained of flushes one to two per day, sweats not marked, headaches, joint pains, occasional insomnia. Physical examination, except for a blotchy skin with acne was essentially negative. Blood pressure 136/80. Blood count normal. Basal

metabolism minus 3 per cent. Uranalysis negative. She received 100 rat units per injection. She stated that she felt better but original symptoms were very mild.

CASE 7.—E. G., aged thirty-eight, married, natural menopause December 15, 1931. This patient complained of 3 flushes per day, occasional headaches, joint pain in left shoulder, present before cessation of menses. Slight palpitation, psychic disturbances, insomnia. Libido present. Physical examination negative. Basal metabolism minus 4 per cent. Blood count normal. Blood pressure normal. She received 14 injections from March 3 until May 25, 1931. There was slight improvement in symptoms, which were originally mild.

CASE 8.—H. L., aged thirty-one, married, artificial menopause November, 1925 (intrauterine and vaginal radium for endometriosis). Flushes every five minutes. Sweats without flushes, headache (frontal), continuous backaches, palpitation, psychic disturbances, insomnia. Libido unchanged. Physical examination negative. Blood pressure 112/70. Weight 129. Basal metabolism normal. Blood count normal. This patient has been under treatment since 1928. She received placebos and in 1929, she was admitted to the neurologic service of the hospital where she was studied and finally discharged, with no diagnosis being made although abnormal neurologic signs were found. She reported back to the menopause clinic and was placed on theelin which she received from March 9 to June 22, 1931. A total of 23 injections up to 300 rat units per injection were given. At the end of treatment, flushes had decreased to about 3 per day. However, headaches, joint pains, insomnia, and palpitation were still unrelieved. The patient was moderately improved.

CASE 9.—A. S., aged forty-seven, married, weight 147, natural menopause, January 30, 1931. Symptoms appeared September, 1930, flushes every half hour, sweats, headaches, joint pain in right shoulder, palpitation, marked insomnia, libido absent. Physical examination essentially negative. Blood pressure 142/78. Basal metabolism minus 21 per cent. Uranalysis negative. Theelin was begun April 18, 1931 and was continued until April 27, 1931. She received 6 injections with slight improvement. In view of the basal metabolism, minus 21 per cent, she was placed on $\frac{1}{4}$ gr. of thyroid T. I. D.

CASE 10.—R. L., aged forty-seven, married, natural menopause April, 1930. Symptoms began at about that time. They included flushes, profuse sweats, headaches, pain in left knee, psychic disturbances and insomnia. Blood count and basal metabolism not done. Physical examination negative. Patient still has occasional periods of bleeding. She received theelin from April 27, 1931 to June 8, 1931, receiving nine injections up to 250 rat units per injection. She improved so that all symptoms disappeared except the joint pain. She then bled from May 23 to May 26. When seen subsequently, she was having only two mild flushes per day. In this case the improvement associated with the bleeding was so marked that further treatment was stopped.

CASE 11.—R. R., aged forty-three, married, natural menopause February 15, 1931. Symptoms immediately after these included "frequent" flushes, severe headaches, joint pains in elbow and palpitation and insomnia. Physical examination essentially negative. Blood pressure 165/100. Weight 191. Basal metabolism minus 25 per cent. Complete blood count normal except for eosinophiles of 5 per cent. She received theelin from June 8 until August 20, three times a week, 9 injections all together up to 300 rat units per injection. Symptoms were mild. Under treatment they completely disappeared according to her statement at the last examination. This patient was very cooperative and very grateful for the treatment received. This probably influenced improvement considerably.

CASE 12.—A. K., aged forty-two, married, natural menopause five years ago. Complained of flushes every one-half hour, sweats, backache, palpitation, insomnia,

libido absent. Basal metabolism plus 16 per cent. Complete blood count normal. Blood pressure 165/115. Physical examination essentially negative. Received eight injections between August 31 to September 26, 1931, dose gradually being increased to 300 rat units per injection. This patient improved considerably. At the last examination, no other symptoms except palpitation were present.

CASE 13.—A. M., aged forty, married, natural menopause, period in December, 1930 then March 4, 1931. She complained of flushes, sweats, pains in the elbow and feet and palpitation. Some insomnia. Physical examination is negative. Basal metabolism minus 3 per cent. Urinalysis negative. Blood count normal. This patient received 7 injections of theelin up to 200 rat units per injection from April 13, to May 11, 1931, during which time she had two episodes of bleeding with complete alleviation of symptoms. As she was menstruating, treatment was stopped. Theelin was probably a factor in causing the bleeding. Her symptoms aside from the time she was bleeding, were only slightly improved.

CASE 14.—B. B., aged forty-four, married, natural menopause June 1930. Symptoms appeared August, 1930. Complained of flushes five times daily. Headaches, joint pains in arms, leg and back, palpitation, psychic disturbances. Libido always absent. Physical examination negative. Blood pressure 156/90. Basal metabolism minus 4 per cent. Blood count except for 43 per cent of lymphocytes was normal. Urine negative. She received 15 injections of theelin up to 150 rat units per injection. She showed some improvement. Flushes were reduced to one or two per day and other symptoms were also improved. She also reported increased libido. She then had a period in April and another period in May. Treatment was discontinued as symptoms disappeared with the bleeding.

CASE 15.—M. D., aged twenty-five, single. A case of secondary amenorrhea. This patient menstruated every seven to twelve months. She showed kyphosis, hirsutes, girdle obesity. Basal metabolism varied from plus 2 per cent to minus 15 per cent. Urine negative except for trace of albumin and moderate white blood cells on several occasions. Thyroid was not well tolerated and produced no effect. She also received antuitrin injections which was followed by staining after 10 injections on October 18, 1930. No bleeding occurred until she received theelin from January 22 to February 2, 1931, on which date she began to bleed and bled for one day. This occurred after 5 injections. Theelin was then discontinued in order to see if patient would have a period the following month. As she did not menstruate, treatment started again on March 9, 1931. She received 12 injections up to March 29 when treatment was stopped in order to watch for effect. She again spotted on April 6 and 7. She then received several large doses of theelin up to 200 rat units and then bled again, June 1, 1931. Her various other complaints resulted in her being admitted to the hospital where she was laparotomized by the surgical service for a pelvic tumor which was not found. It is very likely that the episodes of bleeding in this case, were produced by the injections of theelin. They were proved menstrual periods as uterine mucosa was found in the hemorrhagic discharge.

CASE 16.—A. M., aged thirty-eight, married, artificial menopause (radiotherapy July, 1930). Symptoms soon after. She complained of three or four flushes per day, headaches, sweats, joint pains in the elbows and insomnia. Physical examination essentially negative, except for tenderness over left elbow joint and a somewhat hypertrophied heart. Blood pressure 112/76. Basal metabolism minus 3 per cent. Urine examination negative. Blood count normal. She received 6 injections from March 26 to April 6, 1931 in increasing doses to 150 rat units per injection. At the end of treatment, the patient was very moderately improved, but was still having

occasional flushes, headaches, and joint pains. In this case the patient's psychic condition was also considerably improved.

CASE 17.—D. L., aged forty-four, married, natural menopause, May, 1929. Symptoms immediately afterward including moderate flushes, some sweats, headaches, stiffness in the joints, moderate palpitation, insomnia. Libido present. Physical examination negative. Blood pressure 160/90. Weight 149. Basal metabolism minus 2 and 1 per cent. This patient from the very beginning showed a marked globus hystericus with associated nervous symptoms which were entirely uninfluenced by treatment and were based on difficulties at home with her grown children. She received 15 injections between January 12 and February 16, 1931, in increasing doses up to 125 rat units per injection. Improvement was marked, the only symptoms which persisted were joint pains and insomnia. Hysterical condition was not affected, but patient responded very well to the interest shown in her case which probably influenced the improvement.

SUMMARY AND CONCLUSIONS

1. Thirty-one cases, of which 25 were menopausal, were studied in order to determine the effect of theelin, a biologically potent female sex hormone preparation.

2. The evaluation of improvement or nonimprovement in menopause symptoms as a basis for judgment of the efficacy of the preparation was found to be exceedingly difficult.

3. Seven menopause cases of the 25 patients were definitely improved, 3 with the reestablishment of menstruation. The others were either unimproved or so slightly improved as to be negligible.

4. Two patients with kraurosis on whom vulvectomy had previously been performed showed marked improvement of the itching.

5. Three of 4 amenorrheic patients were unaffected as far as return of menstruation was concerned. The fourth bled convincingly, probably attributable to the material used.

6. In several cases of natural menopause, bleeding, possibly menstruation, followed the injection of theelin.

7. The natural menopause seems to be more amenable to treatment than the artificial climax.

8. Substitution of the female sex hormone alone does not in all cases relieve the menopause syndrome.

9. Other factors such as reduction of the quantity of anterior pituitary hormone may improve the results.

A FURTHER STUDY OF THE ANTERIOR PITUITARY SEX HORMONES

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EXPERIMENTS with anterior pituitary hormones as detected by the original technique of Aschheim and Zondek and its modifications have been in progress in this department since January, 1929. These experiments together with a complete résumé of the literature to date have been discussed recently by T. K. Brown.¹ He reported our use of the female rabbit as the test animal in preference to immature white mice and the use of blood serum as the test substance in preference to urine.

Throughout our work the guiding principle has been that of an experimental study rather than purely a clinical test. Mice, rabbits, and guinea pigs have been used as test animals. Urine, blood serum, blood plasma, extracts of blood serum, plasma and urine, ovarian cyst fluid and extracts of the same and cerebrospinal fluid have been used as test material. We have employed the subcutaneous, intravenous, and peroral routes of administration. Test materials have been taken from cases of suspected and known pregnancy from five days after a missed period to term, ovarian cysts, ovarian cysts complicating pregnancy, extrauterine pregnancy, hydatidiform moles, incomplete, complete; threatened and missed abortions, and amenorrheas due to various causes.

As a result of these studies the routine procedure evolved in this laboratory consists of one intravenous injection of 2 to 3.5 c.c. of blood serum into a virgin female rabbit weighing between 1500 and 1600 gm. Our work with the rabbit was initiated following a report of Scott and Reinhart² in June, 1930, and entirely confirms the earlier conclusions of Friedman³ who, in 1929, suggested the substitution of the rabbit as the test animal of choice in this work. Schneider⁴ and Reinhart and Scott⁵ in recent publications also report satisfactory results with the use of the rabbit as the test animal. All of these investigators use urine as the test material. Zondek,⁶ in a complete review of his work, mentions the use of blood serum injected subcutaneously into mice. We feel that the use of blood serum removes several of the variable factors in the test and simplifies the procedure. We have, thus, a test substance which is sterile, can be given in small doses and removes any possible doubt as to the source of the material. If the degree of reaction can be taken as an index of the concentration of hormone present there is, apparently, a higher concentration in the blood than in the urine. Reinhart and Scott⁵ in their most recent article state that "luteinization of the rabbit ovary begins between the forty-eighth and ninety-sixth hours after injection."

This is true for urine injected intravenously. However with blood serum intravenously, in practically every test well developed luteinization occurs before forty-eight hours.

In earlier experiments small rabbits were used. One series of does weighing between 600 and 900 gm. tested with known pregnancy serum gave entirely irregular and wholly unreliable results. In the entire series of tests performed for clinical diagnosis to date, there have been only two false reactions. Both these tests were performed with blood serum from the same pregnant patient. The does weighed 1140 gm. and 1200 gm. respectively and the tests were completely negative. These are considered false reactions because does of 1200 gm. usually are reliable test animals. We agree with Schneider and Reinhart and Scott with regard to the weight of the rabbits. In our present work rabbits of 1500 to 1600 gm. are used and are entirely satisfactory.

Zondek,⁶ 1930, described methods for concentration and detoxification of urine for the "pregnancy test." The urine is precipitated with 95 per cent alcohol, centrifuged and the sediment is washed with ether. The remaining sediment is dissolved in a fraction of the original volume with water. The anterior pituitary hormones are found in this aqueous solution. Zondek also discusses the physical properties of these active substances. They are easily dialyzable, do not pass through a Berkefeld filter, are destroyed at 60° C. and are adsorbed onto Kieselguhr and charcoal. These properties aid in the differentiation of the pituitary sex hormones from the growth hormone and the ovarian sex hormone.

In performing the test with blood serum as described above, it was noted that occasionally a rabbit died immediately after or within an hour after injection. This death was thought to be due, solely, to an overload of protein material thrown into the vascular system at one time. This "protein shock" was usually noted when smaller rabbits were used and when more than 3.5 c.c. of serum was injected. That this undesired reaction was not due to an increase in the volume of the circulation was known because 10 c.c. or more of urine can be injected without any danger. Referring then to the Zondek technic for concentration of urine, blood serum was treated in a similar manner. One volume of blood serum or plasma, usually 10 c.c., is precipitated with ten volumes of 95 per cent alcohol, shaken vigorously, allowed to stand for half an hour and centrifuged. The alcohol is drawn off and the sediment shaken with five times the original volume of ether and centrifuged again. After pouring off the ether, water or normal salt solution is added to the ether-washed sediment in the same volume as the original volume of serum. This final mixture must be centrifuged rapidly and for at least forty minutes to throw down a gelatinous residue, protein in nature. The supernatant fluid is a greyish, murky, aqueous solution containing the active principles desired. That this solution is not yet protein-free can be demonstrated very easily by reprecipitation with alcohol. A

large amount of protein is removed in this procedure and extracts prepared in this manner can be administered in much larger doses than a corresponding serum. As much as 8 to 10 c.c. of such extracts have been injected intravenously at one time and the degree of reaction in the ovary has been, in most cases, proportional to the volume, when compared with the reaction resulting from 3.5 c.c. of serum.

RESULTS

In this series there are 65 tests to be reported:

<i>Clinical Diagnosis</i>		<i>Test Substances</i>	
Pregnancy	20 Cases	Blood serum	38
Abortions	10	Extracts	12
Ovarian cysts	10	Urine	6
Ovarian cysts and		Cerebrospinal fluid	4
Pregnancy	5	Cyst fluid	2
Tubal abortion	4	Miscellaneous	3
Amenorrhea	5		—
Sarcoma of bone	4		65
Miscellaneous	7		
	—		
	65		

Analyzing the results in this series, from the point of view of diagnoses there are twenty tests for pregnancy. Four of these tests were performed with cerebrospinal fluid and are part of a series reported previously, all of which revealed a Type I reaction, i. e., follicle formation without associated hemorrhage or corpus luteum formation. Six tests in this group were carried out with extracts of blood serum, plasma or urine as the test material. In five of these six, the doe was used and from 4 c.c. to 8 c.c. of the extract was injected into a marginal ear vein at one time. In all cases Type II and Type III reactions resulted within forty-two hours. In one test with an extract of series of immature female white mice was used and injections of 1 c.c. were made on each of two successive days. Autopsy at ninety-six hours revealed a Type III reaction. Ten animals were injected with 3.0 to 3.5 c.c. of blood serum intravenously and with two exceptions Type II and III reactions were noted. These two negative and false tests were obtained with the serum of a pregnant woman and have been discussed above. The explanation of the false reaction lies undoubtedly in the small size of the animals used. Since we have used does of 1500 to 1600 gm. weight no such error has been observed.

There are ten cases of abortion. The "pregnancy" reaction becomes negative about five to seven days after complete abortion. In the absence of sufficient clinical findings or as an aid thereto a positive test becomes useful as an index to the presence of attached decidual tissue. The diagnosis of missed abortion can be made in those cases where a positive test is followed, after an interval of time, by a negative test. Here, too, clini-

cal findings and laboratory information can be correlated. In this group of tests hemorrhagic follicles and corpus luteum formation were obtained when tissue was still present in the uterus, as proved at curettement. Blood serum and extracts were equally reliable.

Ten cases of ovarian cyst revealed, uniformly, a Type I reaction. In this group blood serum and rabbits were used. Ovarian cysts complicating pregnancy returned the same reaction as pregnancy. The cyst fluid and an extract of the same from one of these cysts removed at operation when the patient was sixteen weeks pregnant revealed a strongly positive Type II and III reaction.

Three cases of old tubal abortion resulted in negative or Type I reactions. A fourth such case, of only a few hours' duration, was tested by injecting the free bloody fluid found at operation. A marked Type II and III reaction was observed.

Five tests performed for an amenorrhea of only a few days returned Type I reactions and all were substantiated by a subsequent menstrual flow. One menopause amenorrhea resulted in a mild Type I reaction. Cancer of the cervix revealed marked Type I reaction with both serum and extract. Two cases of hydatidiform mole were reported previously and gave the same reaction as pregnancy.

Concerning the peroral route of administration, Zondek⁶ has been able to obtain Type I and Type III reactions by feeding Prolan to infantile rats, but similar results could not be obtained with mice. Only Type I reactions were observed in mice and then only when large doses of Prolan were fed. Janssen and Loeser⁷ reported Type III reactions without hemorrhagic follicles when 20 to 35 gm. female rats were fed an acetone dried powdered anterior pituitary gland. Our own experience with peroral administration is as yet insufficient to report.

SUMMARY AND CONCLUSIONS

Reviewing our entire experiences with over 200 experiments and tests, we emphasize the importance and reliability of this test. No conclusions can be drawn as to the nature of the hormone or hormones except that they are water soluble and are probably adsorbed onto protein.

The doe, weighing about 1500 to 1600 gm. has proved to be the best test animal, blood serum the best test material and intravenous injection the best route of administration.*

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*Since this report was written, an additional 150 tests have been done. In the total of 350 tests there were only two false reactions, noted above.

THE ASCHHEIM-ZONDEK REACTION IN RABBITS

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THE only real drawback to the pregnancy test of Aschheim and Zondek, from the practical viewpoint, is the length of time (one hundred hours) required for its completion.

Much of the recent work on this subject has dealt with the problem of reducing this interval. Zondek has obtained results in fifty hours by a rather elaborate method of concentrating the substance responsible for the reaction. He can place reliability, however, only on positive results. Eberson, using a similar method of concentration and employing immature rats as the test animals has claimed results in thirty-six to forty-eight hours.

Friedman and Lapham, in a recent article, report excellent results in forty-eight hours, using rabbits as the test animals. Their technique is by far the most simple of the rapid methods and requires no elaborate method of concentration. Schneider, employing the technique originally outlined by Friedman, obtained results in twenty-four hours and even speaks of the possibility of twelve hours. Reinhart and Scott have likewise used this method and report favorably.

Our study was undertaken to determine the reliability of the technique originated by Friedman and also to ascertain the shortest interval that would give dependable results. The material presented is based on 163 tests made on 101 different patients. The series includes positive and negative controls, clinical tests and various experiments relating to concentration of urine and reliability of test animals.

TECHNIC

At the beginning of the study we employed the very simple technique used by Schneider. This consisted of the injection of 5 to 7 c.c. of an early morning urine specimen of the patient to be tested into the ear vein of an immature female rabbit. The age of the animal was specified as twelve to fourteen weeks. Our results with this technique were not absolutely satisfactory. Several errors were encountered which seemed, in the main, to be due to two factors.

The first of these appeared to be the faulty specification of the test animals. We found that some rabbits, though definitely of the age limit twelve to fourteen weeks were too poorly developed to be satisfactory. The second factor seemed to be explained by the disregard of the concentration of the urine as indicated by the specific gravity.

To compensate for the latter, we increased the amount of urine injected when the specific gravity was low. The technique was changed so that 5 or 7 c.c. were injected only when the specific gravity was above 1.025; 15 c.c. were used when the specific gravity was between 1.015 and 1.025; and 20 c.c. when the specific gravity was below 1.015. These increased amounts were injected in three or four doses over a period of four or six hours.

In the matter of test animals, we have changed the minimum requirement to fourteen weeks of age and 1500 gm. in weight. As Friedman has shown, however, any female mature rabbit may be used providing she is not pregnant. At present we are using immature animals of the above specifications, post-partum rabbits, or any female animal that has been isolated long enough to rule out pregnancy. If circumstances have not allowed an isolation of at least three weeks, we have laparotomized the animals to rule out pregnancy.

Table I presents the data on the basis of which the changes in technic were made. The size of the ovaries was known in 99 test animals of the age limit twelve to fourteen weeks. We have arbitrarily taken the size of the ovaries as an index of development and divided the animals into two classes, using 1 cm. as the dividing line. The marked difference in the percentage of correct results is shown in Table I.

TABLE I. TWELVE-TO-FOURTEEN-WEEK-OLD RABBITS

OVARIES 1 CM. OR LESS						OVARIES OVER 1 CM.					
5 C.C. 24 HR.			5-20 C.C. 24 HR.			5 C.C. 24 HR.			5-20 C.C. 24 HR.		
NO.	ERROR	CORRECT	NO.	ERROR	CORRECT	NO.	ERROR	CORRECT	NO.	ERROR	CORRECT
11	4	64%	21	8	62%	29	4	87%	38	3	92%

Low Specific Gravity

Case 39	2 mo. Pregnant	2-22-31	5 c.c.	Sp. Gr. 1.005	Test Neg.
		2-28-31	17 c.c.	Sp. Gr. 1.001	Test Pos.
Case 48	4 mo. Pregnant	2-24-31	7 c.c.	Sp. Gr. 1.005	Test Neg.
		2-28-31	16 c.c.	Sp. Gr. 1.009	Test Pos.
Case 29	2 mo. Pregnant Threatened abortion	2-15-31	5 c.c.	Sp. Gr. ?	Test Pos.
		2-26-31	5 c.c.	Sp. Gr. 1.004	Test Neg.
		2-28-31	18 c.c.	Sp. Gr. 1.004	Test Pos.

The second part of Table I shows the effect of low specific gravity in three of the cases. All test animals in this group had ovaries over 1 cm. In the first two cases (Cases 39 and 48) different specimens of urine were used. In the last patient, however, on whom a positive result had been obtained two weeks before a threatened abortion developed, the same specimen was used for the two tests. Our work on this particular phase of the subject has not been completed, but at present it would seem that lack of concentration of the active substance in low specific gravity urines may be a factor in some of the errors.

INTERPRETATION OF FINDINGS

In clinical application, we are at present allowing the test to run forty-eight hours unless there is a request for a more rapid diagnosis. The animals are either autopsied or laparotomized. In interpreting the test, ovarian follicles, regardless of size are disregarded. Likewise, in the mature animals, old corpora lutea have no significance. The result is considered positive only if there is unquestionable evidence of fresh hemorrhage into one or more follicles.



Fig. 1.—Section of normal ovary of rabbit ($\times 185$).



Fig. 2.—Section of rabbit ovary, showing appearance of hemorrhagic follicle of a positive reaction ($\times 185$).

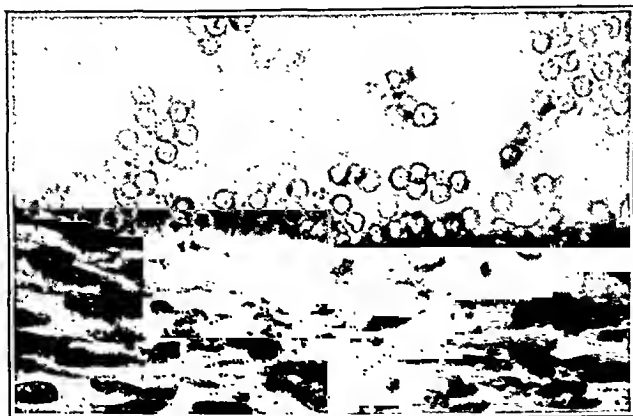


Fig. 3.—Same as Fig. 2 ($\times 750$).

Congestion of the uterus and ovaries is present relatively frequently in positive cases but cannot be relied upon as significant, since it may also be found in negative tests. When the animals are operated upon rather than autopsied, congestion of the ovaries may give some difficulty in interpretation of the test unless it is markedly positive. We have overcome this to a certain degree by using sodium amytal in place of ether-chloroform inhalation anesthesia.

On rare occasions we have encountered small blackish areas in the ovaries, even in immature rabbits. These are apparently old hemorrhages and are not to be confused with the recent hemorrhage of a positive result. While this finding is rare, it is of importance, because such tiny black spots must be disregarded in the interpretation of the test.

The macroscopic findings were checked in the first 100 cases by microscopic sections. The appearance of a normal follicle is shown in Fig. 1, while hemorrhage into the follicle (positive test) is illustrated in Figs. 2 and 3. We do not section the ovaries now unless we are unable to make a definite diagnosis macroscopically.

RESULTS

We have tabulated the results of 123 clinically proved cases according to the technic used. The figures are based on the normal pregnancy and

TABLE II. CONTROL, TWENTY-FOUR HOURS (48)

PREGNANT (NORMAL)	POSITIVE					NEGATIVE			
	5 C.C.		5-20 C.C.			5 C.C.		5-20 C.C.	
	NO.	ERROR	NO.	ERROR		NO.	ERROR	NO.	ERROR
2 Months	3	0	3	0	Male	1	0	1	0
3 Months	1	0	0	0	Female Norm.	2	0	0	0
4 Months	3	2	8	2	Female Menst.	0	0	1	0
5 Months	2	1	3	0	Metrorrhagia	0	0	2	0
6 Months	2	1	0	0	Menorrhagia	0	0	1	0
7 Months	1	0	2	1	Subinvolution	0	0	2	0
8 Months	0	0	1	0	Menopause	0	0	1	0
9 Months	2	0	1	0	Carcinoma	1	0	1	0
					Lactating	0	0	1	0
					P.I.D.	0	0	1	0
					Diabetes	0	0	1	0
Total	14	4	18	3		4	0	12	0

negative cases. Table II shows the controls. There were 32 known pregnancies from two to nine months. The seven errors were all subsequently positive. Sixteen negative controls were without error; these tests included males, normal females, menstruating and not menstruating, functional menorrhagia and metrorrhagia, subinvolution (six weeks and two months postpartum), lactation with amenorrhea, normal menopause, pelvic inflammatory disease and diabetes.

TABLE III. CLINICAL TESTS, TWENTY-FOUR HOURS (64)

PREGNANCY	POSITIVE					NEGATIVE			
	5 C.C.		5-20 C.C.			5 C.C.		5-20 C.C.	
	NO.	ERROR	NO.	ERROR		NO.	ERROR	NO.	ERROR
5 Weeks	2	1	1	1	Pos. Preg. 3 wk.	1	0	1	0
6 Weeks	3	0	4	0	Delayed Period	3	0	5	0
7 Weeks	1	0	0	0	Amenorrhea	2	0	4	0
2 Months	3	2	20	4	Lactating	1	0	0	0
3 Months	0	0	2	1	Metrorrhagia	2	0	4	0
Threatened Abortion	2	0	0	0	Menorrhagia	1	0	0	0
					Menopause	1	0	0	0
					Pseudocyesis	0	0	1	0
Total	11	3	27	6		11	0	15	0

Table III includes 64 clinical tests. There were 38 patients who have subsequently been proved pregnant. Of this number 9 results were erroneous but all were correct at a later test. Three patients were five weeks from the last period, the test being performed to confirm suspected pregnancy. Seven tests were made during the sixth week after the last period; in five of these cases the test corroborated clinical findings. The other two cases in the group are of special interest.

One patient did not have a pelvic examination, pregnancy being diagnosed by means of the test alone. The second case was a suspected ectopic pregnancy. Although there was no vaginal bleeding, pain and a small, tender mass in one culdesac as well as a slightly enlarged uterus suggested an extrauterine pregnancy. An exploratory laparotomy was performed and a normal intrauterine pregnancy accompanied by a corpus luteum cyst found. The seven weeks test confirmed the clinical diagnosis. Of the 20 two-month cases, 18 likewise confirmed clinical diagnoses and two deserve comment. In the first instance, the hymen was intact and a satisfactory examination could not be made. The other patient was lactating from a previous pregnancy and had not menstruated since that pregnancy. The two three-months tests were merely confirmatory. Both threatened abortions were during the second month, the differential diagnosis being materially aided by a positive test in each instance.

In the 26 negative clinical tests, pregnancy has definitely been ruled out; there were no errors in this group. In two individuals, pregnancy was suspected because of nausea one week before expected normal menstruation. In each instance the test was negative and the patient had her normal period. Eight cases were done in unexplained delayed periods which varied from two days to two weeks. All of these patients eventually menstruated. Of the 6 amenorrhea cases, 3 are unexplained. The other three were as follows:

Two were definite hypothyroid cases, neither having flowed in several months. The third patient had pulmonary tuberculosis. There were likewise 3 metrorrhagia cases not accounted for, the remaining three being explained in the first instance by subinvolution, in the second by retained products following an abortion, and in the last by a bleeding vessel consequent to a cervical repair. The menorrhagia case was apparently functional. A differential diagnosis between pregnancy and menopause was made by the negative test in the next instance. The pseudocyesis case was in a woman fifty years of age who had not menstruated in six months and claimed she had felt life for several months. The true diagnosis was menopause.

Table IV shows the tests made with the forty-eight hours technic. While the number is comparatively small, it is of importance since Friedman and Lapham report 100 per cent results in 108 tests with this technic.

TABLE IV. FORTY-EIGHT HOURS FIVE TO TWENTY C.C. (11)*

	NO.	ERROR
Positive Control:		
9 months pregnant	1	0
Negative Control:		
Female menstruating	1	0
Ovarian Cyst	1	0
Menorrhagia	1	0
Clinical Tests:		
6 weeks pregnant	3	0
2 months pregnant	3	0
Delayed period	1	0

*A recent check-up of 100 additional tests showed 97 per cent to be correct.

A comparison of the results obtained with the various technics is shown in Table V. The 5 to 20 c.c. twenty-four hour group shows a correct percentage of 93 per cent if we exclude four errors which we know were due to unsatisfactory test animals.

TABLE V. CLINICAL TEST AND CONTROL (123)

	NO.	ERROR	CORRECT
All Technics	123	16	87%
5 c.c., 24 hr.	40	7	83%
5-20 c.c., 24 hr.	72	9	88%
5-20 c.c., 48 hr.	11	0	100%

HYDATIDIFORM MOLE AND CHORIONEPITHELIOMA

The behavior of the test in hydatidiform mole and chorionepithelioma is illustrated in Table VI. In the first case, the uterus did not enlarge, normally and a diagnosis of missed abortion was made. Seven months

TABLE VI

HYDATIDIFORM MOLE	CHORIONEPITHELIOMA
2-11-30 Delivery of normal child	6- 2-29 Last period
6-25-30 Last period	4- 8-30 Hydatidiform mole expelled
12-16-30 Uterus size 3½ mo. pregnant Diagnosis: missed abortion	8-12-30 Pelvic examination negative
1-27-31 Aschheim-Zondek, positive Diagnosis: hydatidiform mole	1-22-31 Uterus Negative Mass ½ inch Adj. to urethra
2- 3-31 Uterus size 4 mo. pregnant	1-28-31 Aschheim-Zondek, positive Diagnosis: chorionepithelioma
2-13-21 Aschheim-Zondek, positive	2-20-31 Aschheim-Zondek, positive
2-15-31 Hydatidiform mole expelled	2-20-31 Died. Cerebral embolus Autopsy: chorionepithelioma Postmortem eath. spec. positive
2-17-31 Fluid aspirated from vesicles Aschheim-Zondek, positive	
2-23-31 7 days postpartum Aschheim-Zondek, negative	
3-15-31 Aschheim-Zondek, questionable	
4- 3-31 Aschheim-Zondek, negative	

TABLE VII. FETAL DEATHS IN UTERO

6- 9-30 Last period
2- 3-31 Aschheim-Zondek positive
2- 5-31 Fetal death
2- 8-31 Aschheim-Zondek negative (Small rabbit)
2-11-31 Aschheim-Zondek questionable, macroscopically positive, microscopically Delivered macerated fetus, hydrocephalic
2-15-31 Aschheim-Zondek negative
6-14-30 Last period
2-23-31 Fetal heart unusually strong
3-10-31 Fetal movement not felt; no fetal heart
3-12-31 Aschheim-Zondek positive
3-15-31 Aschheim-Zondek positive
3-23-31 Aschheim-Zondek positive
3-28-31 Aschheim-Zondek negative
3-29-31 Expelled macerated fetus; true knot in cord
10-15-30 Last period
1- 3-31 Began flowing
2-28-31 Aschheim-Zondek questionable, macroscopically negative, microscopically
3- 5-31 Aschheim-Zondek negative
3-10-31 Aschheim-Zondek negative
3-12-31 Still flowing, uterus small Diagnosis: missed abortion
3-21-31 Bleeding increased, dilatation and curettage Diagnosis: confirmed

after the last period, the uterus was only about the size of a three and one-half months' pregnancy. At this time the test was positive and the diagnosis changed to hydatidiform mole. The diagnosis was confirmed when the mole was expelled one month later. It is of interest to note that a positive reaction was obtained with fluid aspirated from the vesicles of the mole.

The second patient expelled a hydatidiform mole ten months after she stopped menstruating. Pelvic examinations were negative until eight months after the delivery at which time a small mass was palpated adjacent to the urethra. A test performed at this time was positive and a diagnosis of chorionepithelioma made. The patient died one month later and the diagnosis was confirmed by autopsy.

INTRAUTERINE DEATH

The results with death of fetus in utero are shown in Table VII. They are not especially consistent. In the first instance there was a known fetal death. The following day the test was negative, but the correctness of this test is doubtful since the rabbit used was quite small. Three days later the test was questionable. In the second case, the test remained positive for at least thirteen days, but was negative in eighteen days. The last case was one of missed abortion in which the test confirmed the clinical diagnosis.

COMMENT AND SUMMARY

There are but few instances in which an immediate diagnosis of pregnancy is absolutely essential. When such knowledge is of importance, the test is of great value. Ordinarily the forty-eight hour technic is satisfactory and undoubtedly gives the most reliable results. Where speed is the paramount issue, the twenty-four hour test offers close to 90 per cent efficiency.

Great care must be exercised in selection of satisfactory test animals and in the injection of a sufficient amount of urine, especially if the specific gravity is low. It is necessary to be quite cautious when the larger amount of urine is injected intravenously. Occasionally shock will be noted. We have often given 7.5 c.c. at one injection, but find 5 c.c. more satisfactory. The rabbits will tolerate this amount every two hours. We have had only one test animal die from shock. Three other animals died, but in each instance definite putrefaction had taken place in the specimen. This fact emphasizes the necessity of using only fresh urine although we have demonstrated the substance to be active as late as seven days after the specimen had been collected.

Both Friedman and Schneider mention the possibility of a twelve-hour test since it is well known that ovulation takes place in the rabbits in approximately ten hours. We have completed six tests on known pregnancies in this short interval. Four of these were negative, one

questionable and one definitely positive. It is possible that with a more refined technic better results may be obtained with the twelve-hour test.

Our experience with extrauterine pregnancy has been limited to one case. In this instance the test was markedly positive in forty-eight hours and laparotomy revealed a ruptured ectopic.

Where one is dealing with a suspected hydatidiform mole or chorion-epithelioma, the test is of exceptional importance. Again in individuals who have had hydatidiform moles, the tests should be used at regular and frequent intervals since a positive reaction may be the first indication of a beginning chorionepithelioma.

It has been our intention to approach the subject purely from the clinical aspect. Hence we have purposely avoided any discussion of the explanation of the reaction.

CONCLUSIONS

1. Nonpregnant female rabbits at least fourteen weeks old and 1500 gm. in weight are satisfactory test animals for application of the Aschheim-Zondek principle.

2. When a proper amount of urine is injected intravenously in satisfactory test rabbits, the test is reliable in 90 per cent of the cases within twenty-four hours.

3. The modification of the Aschheim-Zondek test, as described, is a valuable aid in the diagnosis of pregnancy, hydatidiform mole, and chorionepithelioma.

I wish to express my appreciation of the essential assistance rendered by the Department of Pathology in this study.

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MODIFICATIONS OF THE HORMONE TESTS FOR THE DIAGNOSIS OF PREGNANCY*

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*(From the Department of Gynecology of the Post Graduate Hospital and
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SINCE the introduction of the Aschheim-Zondek test for the diagnosis of pregnancy, in 1928, numerous articles have appeared demonstrating the value of the underlying scientific and theoretical considerations of the test. More recent literature concerning the subject has been centered about simplification of the procedure by the use of rabbits rather than mice. This is due to the fact that there is considerable difficulty in having 5 or 6 immature female mice ready for use. Friedman, in 1929, demonstrated ovulation in rabbits twenty-four hours after the injection of 5 c.c. of urine obtained from a pregnant woman. His method shortened the time required for the performance of the test, demonstrated the practicability of using rabbits, and attained as high a degree of accuracy as Aschheim and Zondek. Schneider in 1931 using rabbits in 100 cases also showed the simplicity of this process over the mice method. Reinhart and Scott, in 1929 confirmed Friedman's work and in May of 1931 altered the test as follows: They perform a laparotomy on the rabbit twenty-four hours after the injection of urine. If no corpora hemorrhagica are present the ovaries are returned and again 5 c.c. of urine are injected into the marginal vein of the ear and the abdomen is again opened twenty-four to thirty-six hours later for a final check.

It is to be noted that in all the rabbit methods described it is advised that the animals should be kept in separate pens from one week (Reinhart and Scott) to three weeks (Friedman and Lapham) before using the rabbits. This complicates the test. In all of these methods the animals are killed or used for other purposes, which increases the cost of performing the test. Schneider mentions the possibility of obtaining a positive reaction in eight to twelve hours after the injection, and where time is an element he advocates using 2 rabbits, killing and examining one at the end of twelve hours.

By using the following method some of the above difficulties to a certain extent are eliminated.

TECHNIC

Supposedly isolated and nonpregnant female rabbits over three months of age and bought directly on the market and kept for ten hours. Immediately before the

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injection of 10 c.c. of morning specimen of urine, the animal is laparotomized, in the Trendelenburg position. The ovaries at this time are examined taking care not to manipulate the organs or their blood supply in order not to produce circulatory artefacts which may subsequently be misinterpreted. The size and color of the ovaries and character of any vesicles, which represent graafian follicles, and the presence and number of any blood follicles are all carefully noted and recorded. If an early pregnancy is present or corpora hemorrhagica found, another animal is used. At intervals of six to twelve hours depending upon the urgency of the case, the abdomen is opened under ether anesthesia. The earliest changes in the ovaries consist in an increase in size and a change in color from a pale yellow to a yellowish

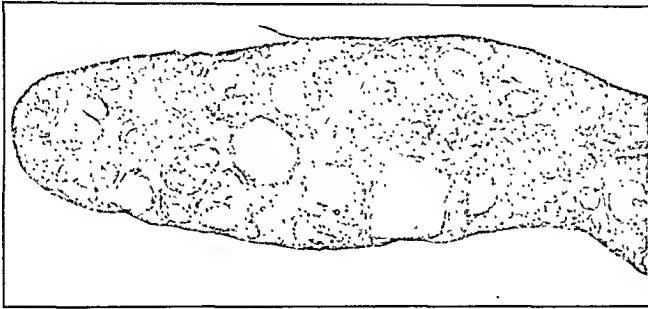


Fig. 1.—Shows the size of ovary from "isolated" rabbit with many follicles and relatively little interstitial glandular tissue. Stains for fat reveal only small isolated foci of lipoids in the interfollicular tissue and very little deposition of lipid granules in the graafian follicle cells and in the zona pellucida.

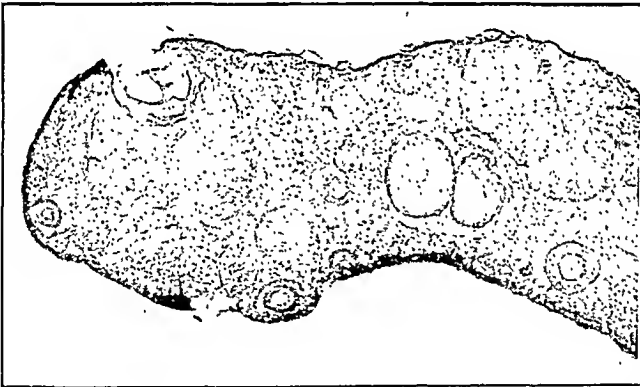


Fig. 2.—Rabbit's ovary five hours after intravenous injection of 10 c.c. of urine from a pregnant patient. Note marked increase in size (compare with Figure 1, of same magnification), the relatively small number of follicles and the enormous widening of the interfollicular spaces due to tremendous deposition of lipoids and increased vascularity.

pale red. In the five-hour specimen demonstrated it is seen that the organ has practically doubled in size following the injection of 10 c.c. of urine from a pregnant patient. If the animal is reopened at the end of twenty-four hours the changes fully described by other authors are seen as in Figs. 2 and 3.

Caution in the administration of ether to the animal is necessary in order not to kill the rabbit by over-saturation with the anesthetic. However, some of the rabbits were given 5 anesthetics within a period of ten hours without any untoward effects. Chloroform and sodium amytal were found unsatisfactory in these experiments.

During the course of the intravenous injection of urine, one of the animals died, after several convulsions. Upon examination of the specimen of urine it was found to contain a large amount of indican.

Upon completion of the test if a "negative" reaction of the ovaries is found, the animal can be used again after thirty-six hours. If the test is "positive" the rabbit can be used again after a period of three weeks.



Fig. 3.—Rabbit's ovary twenty-four hours after the injection of 10 c.c. of urine showing two hemorrhagic follicles, same interstitial glandular tissue changes as in Fig. 2, and marked hyperemia of the thecal vessels and interfollicular spaces.

CONCLUSIONS

1. Preliminary laparotomy of rabbits obviates the necessity of keeping the animals for three weeks before performing the test, and enables us to know the exact state of the ovaries before starting the procedure.
2. In order to shorten the period of obtaining a positive reaction for pregnancy in rabbits preliminary and repeated subsequent laparotomies are advised.
3. Laparotomy rather than autopsy of the animals decreases the expense of the test because they can be used repeatedly.

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(For discussion, see page 761.)

A COMPARISON OF THE SEDIMENTATION AND RUGE VIRULENCE TESTS IN 150 GYNECOLOGIC CASES*

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THE standard method of determining the indications and conditions for operation in pelvic inflammatory disease is an history of continued invalidism; a normal leucocyte count and a normal temperature. If an exacerbation of the infection has occurred then a period of at least ten days of normal temperature has to be observed before the chronic inflammatory pelvic lesions are to be attacked surgically.

In late years two laboratory tests have been advocated; namely, the erythrocyte sedimentation test and the virulence test of the cervical secretion. A sedimentation time of less than sixty minutes signifies that the patient cannot be safely subjected to a gynecologic pelvic operation as it indicates the presence of an actively acute infection somewhere in the body. A positive virulence test on the other hand means the existence of pathogenic bacteria of some kind in the genital tract contraindicating operations on the pelvic organs due to the danger of postoperative infections and sepsis.

The purpose of these investigations is to record our observations made in 150 patients of which 132 were subjected to gynecologic operations and in which the safe time of operation was determined by the standard method of the leucocyte count, temperature, history and physical examination. In all these patients the erythrocyte sedimentation time and the virulence tests were done. Thus a comparison could be made between the prognostic efficacy of the older method and the erythrocyte sedimentation time and the cervical virulence test.

TECHNIC

The rate of sedimentation was determined with the aid of the Balachowski sediotessometer. A sterile pipette is rinsed with a 5 per cent neutral potassium oxalate solution. The tip of the finger is cleansed with ether, and blood is drawn into the pipette as is done in making a blood count except instead of drawing the blood with the mouth the squeezing of a rubber hose attached to the top of the pipette creates negative pressure. The pipette which is graduated in millimeters is placed in a stand which has a level regulator and the column of blood is placed at 0 by turning a screw attached to the top of the hose. Readings were recorded at 15, 30, 60, 120 and 180 minutes. A drop of 30 mm. in one hour corresponds to the Linzenmeier method of a drop of 18 mm. in one hour and is considered the dividing line between safe and unsafe operation.

In the Ruge virulence test 5 c.c. of blood drawn from the cubital vein under aseptic precautions is defibrinated by shaking for 5 minutes in a sterile glass tube containing

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glass beads. One half c.c. of this blood is placed in each of two tubes one of which is inoculated with 2 or 3 loopfuls of vaginal or cervical secretion and the other is kept as a control. Smears are made from the contents of both tubes which are immediately thereafter incubated at 37.5° C. Smears are repeated at hourly intervals for three hours and stained with methylene blue. If the organisms increase within three hours the test is positive; i.e., organisms pathogenic for the host are present in the genital canal.

Both tests were done at the same time of the day on the day previous to operation and entirely unknown to the surgeons who were members of the Cook County Hospital gynecologic staff. A vaginal smear, hemoglobin per cent (Talquist), leucocyte and differential counts were done in every patient also the day previous to operation. The duration of the illness, temperature, character of the operation and complications were taken from the history. The diagnosis was taken from the pathologic report.

Of 150 cases examined 132 were operated upon. Among the latter were 29 cases of salpingitis with abdominopelvic operations, 17 cases of uncomplicated myomata with hysterectomies, 7 cases of myomata complicated with salpingo-oophoritis, 12 cases of carcinomata cervicis with radium insertions, 23 cases of other abdominal pelvic pathology with pelvic operations, 33 cases of vaginal pathology with vaginal operations and 11 cases of combined vaginal and abdominal pathology with combined operations.

The salpingo-oophorectomies were divided as follows: (1) Eight cases with a S.T. of 120 minutes or more and without any morbidity or mortality. They also had a negative virulence test. (2) Five cases with a S.T. of 60 minutes or more. Two had stitch infections but negative virulence test. One doubtful virulence test was obtained but without any postoperative complications. (3) Seven cases with a S.T. of 30 minutes or more including one positive virulence test. There were no morbidities or mortalities. (4) Five cases with a S.T. of 15 minutes or more. One had a stitch infection. All had negative virulence tests. (5) Four cases with a S.T. of less than 15 minutes. One patient had a fecal fistula and another a slight temperature for nine days. All had negative virulence tests.

Among the myomata with hysterectomies were 8 cases with a S.T. of 120 minutes or more. Three had a positive virulence test but without any morbidity or mortality. Three cases had a S.T. of 60 minutes or more. All had negative virulence tests and no morbidity or mortality. Two cases had a S.T. of 30 minutes or more. Both had negative virulence tests and were without any morbidity or mortality. Three cases had a S.T. of 15 minutes or more. One of these had a temperature of 100° F. for ten days. Another had a doubtful virulence test but no complications. There was one case with a S.T. of less than 15 minutes and a negative virulence test which developed a rectovaginal fistula.

Among the myomata complicated with salpingo-oophoritis were: One case with a S.T. of 120 minutes or more. Three cases with a S.T. of 60 minutes or more one of which had a temperature of 100° F. for 22 days. Two cases with a S.T. of 30 minutes or more one of which had a stitch

infection. One case with a S.T. of less than 15 minutes and no morbidity. All seven had negative virulence tests.

Of 12 cases of carcinoma cervicis with radium insertions one had a S.T. of 120 minutes or more, a negative virulence test and no complications. One case had a S.T. of 60 minutes or more, a negative virulence test and no complications. Two cases had a S.T. of 30 minutes or more, negative virulence tests and no complications. Four cases had a S.T. of 15 minutes or more. Two of these, one with a positive and one with a doubtful virulence test developed septic temperatures. Four cases had a S.T. of less than 15 minutes. One of these with a positive virulence test died 8 days after the radium insertion from a septicemia. Another case with a doubtful virulence test developed a septic temperature. The other two had negative virulence tests and no complications.

Among 23 cases of other abdominal pelvic pathology with pelvic operations, 8 had a S.T. of 120 minutes or more. All had negative virulence tests and no morbidity or mortality. Two had a S.T. of 60 minutes or more and negative virulence tests and no morbidity or mortality. Nine had a S.T. of 30 minutes or more. Three of these had a positive virulence test one of which developed a slight temperature for 11 days after the operation which was a supravaginal hysterectomy. The diagnosis was fibrosis uteri. Another patient with a negative virulence test died of a pneumonia 3 days after the operation. Three cases had a S.T. of 15 minutes or more one of which had a reactivation of a pulmonary tuberculosis. All had negative virulence tests. There was one patient with a S.T. of less than 15 minutes, a negative virulence test and no complications.

Among 33 cases of vaginal pathology with vaginal operations were 11 cases with a S.T. of 120 minutes or more. Two of these had positive virulence tests but without any complications. One patient with a negative virulence test developed a postoperative pneumonia. Twelve cases had a S.T. of 60 minutes or more with negative virulence tests. There were no morbidities or mortalities in this group. Five cases had a S.T. of 30 minutes or more. One had a positive virulence test. There were no morbidities or mortalities. Three cases had a S.T. of 15 minutes or more. One had a positive and one a doubtful virulence test. The patient with a doubtful virulence test developed a sore throat with pyelitis following the operation. Two cases had a S.T. of less than 15 minutes with negative virulence tests and no complications.

There were 11 cases of combined vaginal and abdominal pathology with combined operations. Three of these had a S.T. of 120 minutes or more, negative virulence tests and no morbidity or mortality. Five cases had a S.T. of 60 minutes or more with one doubtful virulence test. The patient with the doubtful virulence test died of a septic peritonitis 6 days after the operation which was a dilatation, curettage, amputation of the cervix and bilateral salpingectomy with defundation. Three cases had a S.T. of 30 minutes or more. Two had positive virulence tests. One of the latter died of a septic peritonitis 3 days after the operation which was a

Sturmdorf excision of the cervix, a bartholinectomy and a bilateral salpingectomy.

SUMMARY

Seventy-one patients with a S.T. of 60 minutes or more were operated upon, 4 developed morbidities and there was one death. Sixty-one patients with a S.T. of less than 60 minutes were operated upon with 12 morbidities and 3 mortalities.

S.T.	NO. CASES	NO. MORBIDITIES	NO. MORTALITIES	PER CENT
60 min. or more	71	4	1	7
Less than 60 min.	61	12	3	24.6

In the Ruge virulence test 111 cases were negative with 10 morbidities and 1 mortality. Six cases were doubtful with 3 morbidities and 1 mortality and 15 cases were positive with 3 morbidities and 2 mortalities.

RUGE TEST	NO. CASES	NO. MORBIDITIES	NO. MORTALITIES	PER CENT
Negative	111	10	1	10
Doubtful and	21	6	3	42.8
Positive				

DISCUSSION

The result of the prognostic evaluation of the sedimentation test for the safe time of operation shows that 7 per cent of morbidity and mortality occurred in 71 cases with a S.T. of 60 minutes or more and that 24.6 per cent of morbidity and mortality was seen in the cases with a S. T. of less than 60 minutes. An analysis of the complications following 132 operations shows that four stitch infections occurred: Two in patients with a S.T. of 60 minutes or more, and 2 in patients with a S.T. of less than 60 minutes. A rise in temperature occurred in one patient with a S.T. of 60 minutes or more and a rise in temperature occurred in six patients with a S.T. of less than 60 minutes. There were 2 pneumonias, one in a patient with a S.T. of 60 minutes or more and one in a patient with a S.T. of less than 60 minutes. Septic peritonitis occurred in 2 cases. One had a S.T. of 60 minutes and the other a S.T. of less than 60 minutes. A septicemia, a tuberculosis, a sore throat with pyelitis, a rectovaginal and a fecal fistula occurred in patients with a S.T. of less than 60 minutes. The septicemia was observed in a patient with a group 4 carcinoma. She had a low-grade sepsis before the radium insertion. A reactivation of a pulmonary tuberculosis occurred in a patient who had a bilateral salpingectomy for tuberculous salpingitis. The sore throat with pyelitis occurred 7 days after operation. The rectovaginal fistula occurred during a hysterectomy for fibroids complicated with many firm adhesions. This was purely an accident of surgery. The fecal fistula occurred in a patient who, according to the history, had been ill 7 days, had a temperature of 99.4° F., 13,000 leucocytes and 85 per cent polys. The pathologic report was chronic tubovarian abscess and chronic salpingitis.

In order to correctly evaluate the prognostic efficacy of the sedimentation test it would therefore be necessary to subtract in addition to the carcinomas, the postoperative pneumonias, tuberculosis, sore throat with pyelitis, rectovaginal and fecal fistulas. We would then have the following:

COMPLICATION	S.T. OF 60 MIN. OR MORE	S.T. OF LESS THAN 60 MIN.
Stitch infection	2	2
Temperature	1	3
Septic peritonitis	1	1

OR

S.T.	NO. CASES	NO. MORBIDITIES	NO. MORTALITIES	PER CENT
60 min. or more	66	4	1	7.5
Less than 60 min.	49	5	1	12.2

If we make the same correction for the Ruge test as for the sedimentation test the result is as follows:

RUGE TEST	NO. CASES	NO. MORBIDITIES	NO. MORTALITIES	PER CENT
Negative	99	5	1	6
Doubtful and } Positive	16	3	1	25

A striking difference in the prognostic efficacy between the sedimentation test and the Ruge virulence test was observed in the carcinomas. There were 8 cases with a sedimentation time of less than 60 minutes. Four of these had a positive or doubtful virulence test. Complications occurred in all four of the latter and in none of those having a negative virulence test.

Had the sedimentation time been used as an indicator for the time of safe operation then 61 of the 132 patients or 46 per cent would not have been subjected to operation. Among the latter not yet mentioned the diagnosis was as follows:

CASE	S.T.	DIAGNOSIS	MORBIDITY	MORTALITY
37	30 min. or more	Adenocarcinoma of corpus	0	0
64	30 min. or more	Ovarian cyst	0	0
74	30 min. or more	Retroversion	0	0
81	30 min. or more	Cystic ovaries	0	0
88	30 min. or more	Retroversion	0	0
97	30 min. or more	Papillary cystadenoma	0	0
148	30 min. or more	Ovarian cyst	0	0
12	30 min. or more	Relaxed vaginal outlet	0	0
65	30 min. or more	3d-degree prolapse	0	0
91	30 min. or more	Relaxed vaginal outlet	0	0
77	15 min. or more	Retroflexion, cystic ovaries	0	0
135	15 min. or more	Ovarian cyst	0	0
39	15 min. or more	Cervical polyp	0	0
146	15 min. or more	Senile vaginitis (dilatation and curettage)	0	0
138	Less than 15 min.	Ectopic pregnancy	0	0

CONCLUSIONS

1. An increase in sedimentation speed of 60 minutes or less was observed in more than 50 per cent of the cases of inflammatory adnexitis, uncomplicated and complicated fibroids and the carcinomata, and in

about 23 per cent of other abdominal and vaginoabdominal pathology not of an inflammatory nature.

2. The presence of virulent organisms is one of the most important causes of postoperative morbidity and mortality but a doubtful or positive virulence test does not depend on the speed of sedimentation.

3. The increase in sedimentation speed is due to some other factor than the virulence of organisms.

4. The sedimentation test is not a reliable guide in the determination of the time for safe operation of adnexal disease.

5. The Ruge virulence test is of value in the prognostication of postoperative morbidity and mortality if the operation takes place at the site of the organisms, usually the cervix.

6. The history, white and differential counts, temperature and physical examination must remain our main guides in the determination of the time for safe operation in adnexal disease, while in cervical and combined cervico-abdominal operations the Ruge virulence test is of undoubted value. A doubtful or positive virulence test contraindicates cervical operations until such a time that the test becomes negative.

THE UNRELIABILITY OF LABORATORY AIDS IN THE DIAGNOSIS OF GONORRHEA IN WOMEN*

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IT IS extremely difficult to secure accurate information regarding the incidence of venereal disease, particularly of gonorrhea. Despite the recognized greater prevalence of gonorrhea, only 8840 cases were reported to the New York City Health Department during the year 1929, an incidence of 0.2 per cent, while 23,772 cases of syphilis were reported during the same period, an incidence of 0.5 per cent.

In an effort to secure information of a more definite character, Brunet¹ endeavored to determine the number of cases of venereal disease under treatment on a specific date by circulating an appropriate questionnaire addressed to every physician and the various institutions in the City of New York. Replies were received from 9920 physicians and 161 institutions. Only 5259 physicians and 98 institutions reported cases under treatment on that date; 4661 physicians and 63 institutions reported that they had no cases under treatment at that time.

The total number of cases of syphilis acknowledged by these agencies was 29,423, an incidence of 0.5 per cent. The total number of cases of gonorrhea was 23,861, an incidence of 0.4 per cent. These figures are somewhat better than those reported to the Health Department, but it

*From the Venereal Disease Service, Department of Health, City of New York.

is still evident that the reported cases of syphilis outnumber those of gonorrhea. Only 5660 females were reported under treatment for gonorrhea as compared with 18,201 males, and 10,810 females under treatment for syphilis. The much smaller number of females having gonorrhea is striking, and the explanation of such a wide discrepancy undoubtedly lies in the fact that the majority of cases are diagnosed by the laboratory technician.

In an effort to assay the justification for this practice, a detailed study of the results of the examinations of women convicted of various offenses, mainly prostitution, during the past eleven years, was undertaken. These examinations were made at the various City prisons, the majority at Jefferson Market. In this group of women in whom venereal diseases are apt to be prevalent, no general idea of incidence can be obtained, but the opportunity for the study of the diseases themselves is unusual. All blood and smear specimens were submitted to the Health Department laboratory for examination. Smears were always taken from the urethra and cervix, and when indicated, from other suspicious locations. All smears were stained by Gram's method.

In Tables I and II the figures for 1925 to 1929 inclusive are given separately so that the statistics of the last five years with the total may be compared, but only the eleven-year figures are mentioned in the discussion. The total number of women examined from 1919 to 1929 was 21,610. Of this number 10,932 or about 50 per cent were found to be infected. Gonorrhea was diagnosed clinically in 6,425 cases, or 59 per cent of those diseased. It is interesting to note in comparison the 5,660 women reported as having gonorrhea out of 16,470 women diseased, or 35 per cent, as reported in Brunet's questionnaire.

TABLE I. THE EXAMINATION OF CONVICTED WOMEN TO DETERMINE THE INCIDENCE OF VENEREAL DISEASE

	1919-1929	1925-1929	PER CENT OF TOTAL EXAMINED		PER CENT OF NO. INFECTED	
			1919-1929	1925-1929	1919-1929	1925-1929
Total number examined	21,610	11,479				
Number with no evidence of venereal disease	10,675	5,912				
Number having venereal disease	10,932	5,567	50	50		
Gonorrhea diagnosed clinically	6,425	3,083	30	30	59	55
Number with smear positive for gonococci	796	444	4	4	7.5	8

TABLE II. RESULT OF SMEAR EXAMINATION IN CONVICTED WOMEN HAVING GONORRHEA

	1919-1929	PER CENT	1925-1929	PER CENT
Total number with gonorrhea diagnosed clinically	6425		3083	
Positive smear in cases clinically diagnosed	460	7	230	7
Positive smear in cases undiagnosed clinically	336		214	
Total number of positive smears	796	13	444	14
Undiagnosed cases with positive smear, added to those diagnosed clinically	6761	12	3297	13.5

SMEAR EXAMINATION

The total number of positive smears found in our cases was 796 or about 4 per cent of the total number examined.

It is clearly evident that the smear examination detects only about one-seventh to one-eighth of the gonococcal infection in women that can be diagnosed by clinical means. It should be remembered in this connection that these percentages represent the results of a single smear examination. The taking of a single smear corresponds to the usual custom of the physician in private or institutional practice when seeking laboratory aid in arriving at a diagnosis. Furthermore, many physicians do not regard a smear as positive unless gram-negative intracellular diplococci are present. No account is taken of the fact that gonococci occur extracellularly as well as intracellularly, and that their characteristics vary, depending on their age, in size and staining qualities. Again, the majority of patients harbor old, chronic infections. The gonococci rapidly disappear from the surface secretions, but one evidence of infection, namely, the pus cell, remains. In order to derive material aid from the examination of smears, more than one smear must be taken. Gram stain, when used in conjunction with the clinical examination, is unnecessary; methylene blue is simpler and equally satisfactory. The smear that does not show typical intracellular gonococci, but does show extracellular diplococci, or atypical intracellular cocci, or the smear that shows nothing but pus cells, should be interpreted in the light of the clinical evidence present. Obviously, the several details are best correlated by the physician who examines the patient. Even when all this is taken into consideration, the smear examination furnishes but meager aid in establishing the diagnosis of gonorrhea in women.

EXAMINATIONS OF CULTURES

Cultures of the gonococcus afford but little additional help. They should only be undertaken in a well-equipped laboratory, manned by ex-

pert technicians. Torrey, Wilson, and Buckell² working in a group of the same type of patients, with the most careful technique, obtained only 28.4 per cent positive cultures. Aside from the difficulty of growing the organism, and the necessity for special media of definite acidity and temperature, failures are numerous, since the other organisms present under the same cultural conditions rapidly overgrow the gonococcus. Even when a growth is obtained and transplanted, and regrown in pure culture, it cannot be identified by smear. Nothing but gram-negative diplococci are present, and inasmuch as there are no pus cells, the diagnosis cannot be made. It therefore becomes necessary to study the action of the organism on the various sugars to make a differential diagnosis. This involves the lapse of at least five days before a report can be rendered. Under these circumstances, culture certainly becomes impractical for a routine diagnosis.

GONORRHEA COMPLEMENT FIXATION TEST

The blood test in gonorrhea is a specific complement fixation test, in that killed gonococci are used as the antigen. The blood test in syphilis is not a specific complement fixation test, because nonsyphilitic material, such as beef heart, is used as the antigen. Theoretically then, the complement fixation test for gonorrhea should be as accurate or more so than that for syphilis. Whether or not this is actually true, may be readily determined from the following discussion.

In discussing the complement fixation test in convicted women, only the figures for 1925 and 1926 are available. Out of a total of 2,795 cases examined, 55, or about 2 per cent, gave a positive complement fixation of 2-plus or over. If one should include the doubtful and 1-plus tests, a total of 243 or 9 per cent could be considered positive. Of the total number examined, 1,041 were diagnosed as having gonorrhea on clinical evidence. In this group, only 28 or 2 per cent had a 2-plus, or over, fixation. Including the doubtful and 1-plus fixations, 113 or 10.8 per cent would be considered positive. At the same time, of the 1,754 cases in which no diagnosis could be made, clinically, 27 or 1.5 per cent had a 2-plus, or over, fixation, and adding the doubtful and 1-plus fixations, a total of 130 or 7.5 per cent were reported as having some degree of fixation. Assuming that these 130 cases in which fixation occurred were missed in clinical diagnosis and added to the 1,041 which were clinically diagnosed, the total of 1,171 clinical cases having 243 fixations of some degree would still be only 20.5 per cent.

It is unquestionably a dangerous practice to base a diagnosis of gonorrhea on a doubtful or 1-plus fixation. Yet even under the most liberal interpretation, a totally inadequate percentage of positive results are obtained. Since 1927 the routine examination of blood specimens for complement fixation reactions for gonorrhea in New York City court cases has been abandoned.

TABLE III. RESULTS OF COMPLEMENT FIXATION TESTS FOR GONORRHEA IN CONVICTED WOMEN

	1925-1926	PER CENT OF TOTAL NUMBER EXAMINED	PER CENT OF NUMBER HAVING GONORRHEA	PER CENT OF NUMBER FREE FROM GONORRHEA
Total number examined	2795			
Positive complement fixation 2-plus or over	55	2		
Complement fixation, including doubtful and 1-plus	243	9		
Number clinically diagnosed as gonorrhea	1041			
Complement fixation 2-plus or over in clinical gonorrhea	28		2	
Complement fixation, including doubtful and 1-plus in clinical gonorrhea	113		10.8	
Number clinically negative	1754			
Complement fixation 2-plus or over in negative cases	27			1.5
Complement fixation, including doubtful and 1-plus in negative cases	130			7.5
Negative cases with some degree of fixation added to cases diagnosed clinically	1171			
Total with some fixation	243		20.5	

TABLE IV. RESULT OF COMPLEMENT FIXATION TESTS FOR SYPHILIS IN CONVICTED WOMEN

	1925-1929
Total number examined	11,479
Positive complement fixation test 2-plus or over	2,914
Percentage positive of total examined	26

The blood examinations for syphilis in the cases examined at the court from 1925 to 1929 showed 2,914 positive fixations of 2-plus or over out of a total of 11,479 cases, or 26 per cent. Here, again, one notes the greater percentage of positive reports in a disease which is far less frequent than gonorrhea.

Additional information regarding the relative value of the blood test for syphilis and gonorrhea may be obtained by comparison of the results in the routine examination of blood specimens submitted to the labora-

TABLE V. RESULTS OF ROUTINE EXAMINATION OF BLOOD SPECIMENS FOR SYPHILIS AND GONORRHEA

	SYPHILIS 1925-1929	GONORRHEA 1925-1929
Total number examined	581,112	45,844
Total positive complement fixation test 2-plus or over	81,507	1,068
Percentage positive	14	2
Total doubtful and 1-plus fixations		3,011
Percentage doubtful fixations		6.5
Percentage positive plus doubtful fixations		8.5

tory in the past five years. There were 581,112 specimens submitted for the Wassermann test, of which 81,507, or 14 per cent, showed a 2-plus or over, fixation. During the same period, 45,844 specimens were examined for gonorrhea, of which 1,068, or 2 per cent, showed a positive fixation of 2-plus or over. Even when adding the 3,011 doubtful cases, and considering the entire 4,079 cases as positive, the percentage would be only 8.5. This comparison further emphasizes the unsatisfactory percentage of positive results obtained in the examination of blood for gonorrhea. It is difficult to understand the uncertain results of the blood fixation test in gonorrhea. One must assume either that no antibodies are produced in this disease, or else that the antigen is at fault. Repeated experiments with many kinds and proportions of antigen have failed to improve the number of positive results. Investigations along these lines still continue, and it is possible that ultimately a more reliable technic will be evolved.

CONCLUSIONS

From the foregoing discussion, the following comments concerning laboratory procedures and their value in the diagnosis of gonorrhea in women seem justified:

1. Repeated smears should be taken and carefully examined.
2. The use of Gram's stain is not essential. In conjunction with a proper evaluation of the clinical examination, the methylene blue stain is adequate for practical purposes.
3. A positive smear is conclusive evidence of infection.
4. A negative smear, even when repeated, does not exclude the presence of a gonococcal infection in women.
5. Suspicious organisms, extra- or intracellular, should be interpreted in accordance with the clinical evidence.
6. Pure spreads of pus cells, even without organisms present, should be regarded as suspicious evidence of gonococcal infection.
7. When cultures are taken and prove positive, they constitute conclusive criteria, but are not practical or well adapted to routine practice.
8. A negative culture does not exclude the presence of a gonococcal infection.

9. The complement fixation test for gonorrhea with the present technic is unreliable. Neither positive nor negative findings are conclusive.

10. Unless an improved technic affording more reliable results is evolved, the fixation test should not be used for the diagnosis of gonorrhea or for the control of its treatment.

Even under the most favorable conditions, it is apparent that laboratory procedures are of minor importance in establishing a diagnosis of gonorrhea in women. A wider appreciation of this fact, with a consequently greater reliance upon the history and clinical evidence, will suggest the correct diagnosis in many of the now unrecognized cases of gonorrhea in women.

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151 WEST SEVENTY-SEVENTH STREET.

SOME OBSERVATIONS CONCERNING ERYTHEMATOUS ERUPTIONS SIMULATING SCARLET FEVER DEVELOPING IN THE PUERPERIUM*

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A REVIEW of the literature yields a wide divergence of opinion as to the etiology of scarlet-like eruptions developing in the puerperium. Williams¹ in his text book of obstetrics discusses this problem at some length. Schamberg and Kolmer² gave numerous essential points in the differential diagnosis of scarlet fever from puerperal sepsis with a scarlatiniform rash. These scarlatiniform eruptions may be associated with severe constitutional reactions with the clinical picture of sepsis accompanied by high mortality; or, they may be mild in character associated with but little constitutional reaction, frequently diagnosed clinically as toxic erythemas. Of late, particularly on the Continent, an attempt has been made to determine the susceptibility of pregnant women to puerperal infection with the streptococcus by the determination of the susceptibility to Dick's toxin. So far, the results of this study have been of little clinical value. In France Blaize and Mayer,³ and De Lavergne and Fruhinsholz⁴ have, at comparatively recent date, discussed these erythematous eruptions developing subsequent to childbirth, concluding that they may develop as a complication of sepsis, or that they may be benign in character, being merely the cutaneous manifestation of some unknown constitutional toxemia.

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During the past seven years eight women, early in the puerperium, suffering from a scarlet eruption that could not be clinically differentiated from scarlet fever, have been received by the contagious service of the Kansas City General Hospital. In all these cases the throat symptoms, so characteristic in the onset of scarlet fever, were extremely mild or completely absent. While the mucous membrane of the entire oral cavity was red in appearance and some degree of sore throat was present, the throat symptoms, if present, were extremely mild and the characteristic adenopathy under the angle of the jaw was wanting. In four of these cases death occurred. Two cases came to necropsy. In the terminal 24 hours great abdominal distention was present, and in the two cases that came to autopsy, the clinical and postmortem findings were such that we must accept the fact that the infection occurred from below. Two of these patients, presenting a scarlet-like eruption which developed subsequent to childbirth, were treated by the administration of Dick's antitoxin. In one instance the therapeutic response was so brilliant that there is no question, in our judgment, as to the therapeutic efficiency of this procedure. In the second case, to be recorded in detail, the eruption was blanched and considerable symptomatic improvement occurred 24 hours subsequent to the administration of the serum. Death occurred, however, on the fourth hospital day, with extreme abdominal distention and the clinical picture of a generalized peritonitis.

In the face of these observations made over a period of years in a contagious hospital, we gained the impression that most cases of scarlet fever in the puerperium were in reality puerperal sepsis. The description that follows is in absolute accord with our clinical impressions of the five preceding cases. On November 11, 1930, opportunity for further study of this question presented itself in the following case:

Patient admitted to the contagious service of the Kansas City General Hospital, November 11, 1930, a multipara 4, age thirty-two, who denied ever having had scarlet fever. At the time of admission the rectal temperature was 104°, pulse 120. Four days prior to admission the patient gave birth to a normal child. The onset of the present illness was abrupt—two days subsequent to the birth of the child—with chills and severe back pain; 48 hours later a diffuse scarlet eruption developed similar to that seen in scarlet fever. The examination of the nose and throat was negative and the history of the antecedent sore throat, so characteristic in scarlet fever, was wanting. Two hours subsequent to the patient's admission to the hospital, 20 c.c. of Dick's antitoxin was administered, subsequently the eruption was markedly blanched. However, the abdomen became markedly distended and death occurred on the fourth hospital day. Blood culture was positive, but the growth was not apparent until several days after the necropsy. The following facts are extracted from the autopsy report of Duncan and De Groat:

"The body is that of a rather large, well-developed, well-nourished white woman about thirty-five years of age. There is a marked cyanosis of the skin over the entire body. The external jugular veins are dilated. The abdomen is enormously distended. Both lungs lie free in their respective cavities. The lower portion of the right lung is of a deep red color, is firm, crepitation is markedly reduced. From the cut surface exudes a large amount of bloody fluid. The left lung shows no changes other than a moderate amount of hypostatic postmortem congestion.

"The pericardial sac contains about 150 c.c. of a clear, straw-colored fluid. The heart is large and dilated. The myocardium has a markedly scalded appearance. No changes are noted in the valves, which are all smooth and flexible. The blood has a watery brownish appearance.

"The peritoneal cavity contains about 3 quarts of straw-colored fluid. The intestines are enormously distended. The peritoneal fluid is cultured. The intestinal tract is otherwise normal.

"The spleen is large and soft. It has a deep red color. The capsule is smooth.

"The uterus reaches within 2 cm. of the umbilicus. It is very large and soft. The pelvic cellular tissue is extremely edematous. The uterus and bladder are removed *en bloc*. The wall of the uterus is extremely soft and edematous. The endometrium is everywhere hemorrhagic, and in places is covered by a soft grayish exudate. Cultures taken from it show a long chain streptococcus—hemolytic in type."

Subsequent to the necropsy De Groat stained several sections from the uterus and was able to demonstrate streptococci underneath the uterine mucosa. De Groat's histologic report follows:

"Sections taken from the endometrium show extensive necrosis, the glands of the mucosa having almost entirely disappeared. The myometrium is extremely edematous, and scattered through it are moderate numbers of polymorphonuclear leucocytes. The changes in the uterus are particularly marked in the region of the cervix. Throughout the wall there are numerous foci of polymorphonuclear leucocytes. In some of the veins thrombosis has occurred. These thrombi are suppurating.

"Gram stains of the uterus and parametrium show innumerable long chain streptococci in the necrotic endometrium. No organisms can be discovered in the deeper tissues."

From the history and the lack of upper respiratory symptoms, the postmortem findings of generalized peritonitis and the staining of the streptococci in the uterine wall, associated with a positive blood culture, we were convinced that this was a case of puerperal sepsis with a streptococcus similar, if not identical, to Dick's streptococcus scarlatina. The specimen of streptococci was forwarded to Dr. Cornelia M. Downs of the Department of Bacteriology, University of Kansas at Lawrence, for study.

The organism, isolated in pure culture from the blood of the patient, was a long chain, gram-positive hemolytic streptococcus. It gave typical hemolysis of the beta type in poured rabbit and human blood agar plates. Culturally it fermented dextrose, lactose, salicin, but not mannit or inulin. It would be classified therefore as a variety of *Streptococcus pyogenes*.

It was thought that it might be of some interest to test out the ability of this strain to produce an extracellular toxin which might give a skin test similar to that of Dick toxin and many other hemolytic streptococci. The organism was cultivated for 48 hours in a 0.5 per cent dextrose-meat infusion broth. This was passed through a Berkefeld filter, tested for sterility, and 0.5 per cent phenol added as a preservative. Similar toxins were prepared from culture No. 40, a hemolytic streptococcus of the beta type from a fatal case of endocarditis. Also filtrates from a hemolytic streptococcus of the beta type No. 57 cultured from a case of

TABLE I*

As a preliminary titration 6 known Dick positive individuals responded as tabulated to the filtered toxin of the streptococci under investigation.

Commercial Dick's toxin	+	+	+	+	+	+
Laboratory strain No. 40. Cultured from a fatal case of endocarditis.	—	—	—	—	—	—
Laboratory strain No. 57. Cultured from scarlet fever obtained from New York Board of Health.	+	+	+	+	+	+
Laboratory strain No. 334. Obtained by blood culture from fatal case of puerperal sepsis under discussion.	+	+	+	+	+	+

*This table is compiled from the cutaneous reactions to a 1:1000 dilution of the filtered exotoxin. Filtrate No. 40 gave slight redness only. Strains 57 and 334 produced definite erythema of above one centimeter when injected intradermally.

scarlet fever. This culture was obtained through the kindness of Dr. Mary Kirkbride, New York State Board of Health.

A group of forty-seven individuals were subjected to the intradermal injection with Dick toxin, the filtrate from culture No. 334, and the filtrate from culture No. 40. The reactions to these exotoxins is recorded in Table II.

TABLE II

CASES	COMMERCIAL DICK TOXIN	FILTRATE NO. 334	FILTRATE NO. 40
5	+	+	+
2	+	+	—
1	+	—	—
5	—	—	+
34	—	—	—

The results obtained in this series of forty-seven cases were widely divergent from the cutaneous response to the original six Dick positive individuals whose reactions are recorded in Table I. For this reason a series of fifty-five students were injected intradermally with commercial Dick toxin and the filtrate from culture No. 334. The results of this observation are recorded in Table III.

A study of Table III shows that twenty-nine individuals gave an erythema in response to the intradermal injection of a streptococci exotoxin. Twenty-six showed no reaction. Of the twenty-nine reactors,

TABLE III

CASES	COMMERCIAL DICK TOXIN	FILTRATE NO. 334
15	+	+
10	+	—
4	—	+
26	—	—

Dick's toxin and the filtrate from culture No. 334 agreed in behavior in fifteen cases. However, ten cases responded to Dick's toxin, but failed to react to filtrate No. 334. Four cases reacted to filtrate No. 334 and were negative to Dick's toxin. Dilutions of 1:1000 were used throughout this series.

Further studies were pursued on a series of twenty-seven individuals. In these cases a dilution of 1:500 of the filtrate from culture No. 334 was used. Also 1:500 dilution of Dick's toxin and a 1:500 dilution of the toxin from strain No. 57 received from the New York Board of Health. Controls were used in all cases using toxin from the respective cultures boiled ten minutes and allowed to cool at room temperature. The results of this observation are recorded in Table IV.

TABLE IV

CASES	COMMERCIAL DICK TOXIN	FILTRATE NO. 334	FILTRATE NO. 57
7	+	+	+
2	+	—	+
2	—	+	+
6	—	—	+
10	—	—	—

A study of the above table reveals an equal number of reactors to Dick's toxin and to the toxin obtained from the streptococcus grown from the blood of the case of puerperal sepsis under discussion. However, the exotoxin from the scarlet fever-producing streptococcus gave more positive reactions than the filtrate No. 334 or Dick's toxin. Controls using the boiled toxin gave a high incidence of reactions. Whether this was due to the hypersensitivity to some substance contained in the broth or to the bacterial protein or to a heat-stable toxin could not be determined. The presence of the preservative is a factor to receive consideration. The degree of redness produced by heated toxin controls was very minor in comparison to a positive cutaneous reaction. Ando⁵ has shown that scarlet fever toxin is very complex, containing heat-stable toxins and if the crude filtrate is used, bacterial proteins to which the skin may be reactive. The Dick toxin used was a commercial preparation and gave very few reactions when heated. Wheeler,⁶ Kirkbride and Wheeler,^{7,8} Williams,⁹ and others have shown that many of the hemolytic streptococci produce toxic substances which will give reactions in human skin. These reactions may be neutralized by scarlet fever antitoxin. The skin test, therefore, cannot be used as a means for the identification of a scarlet fever strain. It is also generally agreed that agglutination tests do not give a satisfactory means of identifying the streptococci. It is of interest to note in this series of 135 individuals subjected to intradermal injections with 4 streptococci exotoxins, that the number of Dick positives was 35.5 per cent. The number of No. 334 positive was 30.4 per cent. These

figures are in quite close agreement with those of Zingher,¹¹ Zoeller,¹² Sherwood,^{13,14} and others.

From the above results we may conclude that we are dealing here with a streptococcus which will produce toxin giving skin reactions similar to the Dick test and which will produce a rash clinically which is blanched by Dick antitoxin.

CONCLUSIONS

1. It is obvious that scarlet fever may attack a woman in the puerperium; however, in our experience, scarlet fever developing in the puerperium is puerperal infection with a streptococcus whose exotoxin is capable of producing an erythematous eruption. This particular streptococcus may invade the blood stream and produce the clinical course of puerperal sepsis with a high mortality. The infection may be confined to the uterus, the constitutional reaction being slight, and the associated erythematous eruption is due to the absorption of the erythema-producing exotoxins. The prognosis in this group of cases is excellent.

2. The rôle of Dick's streptococcus scarlatina in the production of puerperal infections, associated with erythema, cannot, in our judgment, be definitely established. However, the exotoxin elaborated by a streptococcus grown from the blood of women suffering from puerperal sepsis, associated with an exanthem that could not be differentiated from scarlet fever, would produce a characteristic reaction in Dick-positive individuals. The behavior of this exotoxin in Dick-positive individuals did not agree in every case. The agreement in behavior, Dick's streptococcus scarlatina, was so closely associated that biologic differentiation is not possible.

3. Exotoxins from the streptococcus that produce erythematous eruptions simulating scarlet fever in the puerperium are neutralized by Dick's antitoxin.

4. The therapeutic efficiency of the antitoxin is in direct ratio to the exotoxin elaborated. Neutralization of this erythema producing exotoxin of streptococcal origin may be of great therapeutic importance.

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THE EFFECT UPON THE NEWBORN CHILD OF SODIUM ISO-AMYLETHYL BARBITURATE (SODIUM AMYTAL) WHEN USED AS AN OBSTETRIC ANALGESIC AND ANESTHETIC

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THIS study is undertaken to determine whether or not the use of sodium amytal in obstetrics has any harmful effect upon the newborn child.

Morehead and Mussey¹ noted no respiratory embarrassment in normal babies delivered with the aid of sodium iso-amylethyl barbiturate. Massey² noted that the babies of mothers given this drug seemed unaffected. Jaeger,³ in discussing the use of sodium iso-amylethyl barbiturate in cesarean section, mentions that the baby was in about the same state when delivered as when hyoscine, morphine, and caotin were used in twilight sleep. Moore⁴ reports the use of this drug in 4 cases of eclampsia. All babies included in these case reports were small, ranging in weight from 3.75 to 5.66 pounds, but were reported to be in excellent condition and all did well. Robbins, McCallum, Mendenhall and Zerfas⁵ reported 80 babies studied in detail following deliveries in which sodium iso-amylethyl barbiturate anesthesia was used. Of this group 3 were asphyxiated and respiration was started with more or less difficulty; 2 were apneic, and the remainder began breathing with little or no difficulty. Thirty of these babies showed an average weight loss of nine ounces occurring over an average period of three and a half days. Birth weights were regained in an average of eight and a half days. One stillbirth was reported, cause undetermined. They conclude that danger to the child has not been proved. Boucek and Renton,⁶ in a recent experimental study on white rats, found that the amount of sodium iso-amylethyl barbiturate necessary to anesthetize a pregnant rat did not in any way interfere with the viability of the fetus; the fetus was not anesthetized and readily responded to gross stimulation.

One hundred and forty-nine newborn babies, together with their mothers, collected over approximately a year's time, make up this series.* Seventy-eight of these mothers received sodium iso-amylethyl barbiturate either orally or intravenously. Of these, 53 received morphine and hyoscine, while 5 received only morphine preceding or together with, the sodium iso-amylethyl barbiturate. Included in this group were 45 primiparae; the rest were multiparae, including 6 who had gone through two or more pregnancies. Seventy-one of the mothers received no sodium iso-amylethyl barbiturate. Of this group 40 received morphine and hyoscine, and 5 received only morphine during labor. There were 37 primiparae, and 14 multiparae who had gone through two or more previous pregnancies.

All infants in this series received a physical examination by a pediatrician within a few hours after delivery. If there was any question as to a child's condition, it was seen immediately. A routine feeding of half

*These patients were all delivered on the obstetric service of Dr. J. W. Bourland and by his kindness the material was obtained.

TABLE I

GROUP	GRAVIDA			MORPHINE AND HYOSCINE	MORPHINE	TIME IN HOSPITAL BEFORE DELIVERY		AVERAGE TIME IN HOSPITAL BEFORE DELIVERY	AVERAGE TIME SODIUM AMYTAL WAS GIVEN BEFORE DELIVERY	AVERAGE DOSE SODIUM ISO- AMYLETHYL BARBITURATE
	I	II	III OR MORE			MAX.	MIN.			
No sodium iso- amylethyl barbiturate	37	20	14	40	5	24 hr.	30 min.	6.3 hr.		
Sodium iso- amylethyl barbiturate orally	27	12	4	30	2	32 hr.	3 hr.	11.2 hr.	3.75 hr.	0.53 gm.
Sodium iso- amylethyl barbiturate intravenously	28	5	2	23	3	20 hr.	2 hr.	8.8 hr.	2.9 hr.	0.69 gm.

strength skimmed milk with 5 per cent added dextrimaltose was offered every three hours, beginning eight hours after delivery. This feeding was continued only until the mother's breast milk appeared. Additional water was given. All babies were weighed daily. If breast feeding failed to produce a satisfactory gain in weight, supplementary feedings of various cow's milk mixtures were offered. The majority of the babies remained under observation in the hospital for approximately fourteen days.

The mothers were divided into groups, depending upon whether they received no sodium iso-amylethyl barbiturate or were given the drug either orally or intravenously, as shown in Table I. In this table also appears data pertaining to the amounts and time of administration of the drug.

It will be noted that the time of administration varied considerably. As previously mentioned, a considerable number received morphine and hyosine, or morphine alone. Usually it was a routine practice to give these drugs early in the first stage of labor. If the pain was controlled satisfactorily, no other medication was used. The patients given sodium iso-amylethyl barbiturate orally, received the drug in from 0.18 to 0.36 gram doses, repeated as necessary, depending upon the severity of the pain. The time of beginning the oral administration varied from thirteen hours to forty-five minutes before delivery and the total dose varied from 1.62 to 0.18 grams. When sodium iso-amylethyl barbiturate was given intravenously, much the same procedure was followed, except that an effort was made to wait until the first stage of labor was nearly completed. The time of beginning intravenous administrations varied from seven hours to twenty minutes before delivery, and the total dose varied from 1.35 to 0.45 grams. A few patients received the drug both orally and intravenously. These are classified with the latter group. It should be mentioned that nearly all patients received nitrous oxide anesthesia during the actual delivery.

The babies are grouped in the same manner as the mothers, as shown in Table II. This table also includes the maximum, minimum, and average figures for birth weight, initial weight loss, and the time required to regain the birth weight.

There is little difference to be observed in the average figures of these groups. Of the babies delivered without the use of sodium iso-amylethyl barbiturate, 2 were slightly asphyxiated; 1 had symptoms of thymic enlargement which were confirmed by roentgen ray examination; it became symptom-free following roentgen ray treatment. Eighteen of this group required supplementary feeding. In the group delivered with sodium iso-amylethyl barbiturate anesthesia, administered either orally or intravenously, there were 3 babies slightly asphyxiated; 2 with symptoms of thymic enlargement, confirmed and treated as previously noted; 1 had a moderately severe intestinal hemorrhage; 14 of the group required sup-

TABLE II

GROUP	TOTAL NO. CASES	MALES PER CENT	BIRTH WEIGHT		AVERAGE BIRTH WEIGHT	INITIAL WEIGHT LOSS		AVERAGE WEIGHT LOSS	AVERAGE DAYS WEIGHT LOSS OCCURRED	AVERAGE TIME BIRTH WEIGHT REGAINED
			MAX.	MIN.		MAX.	MIN.			
No sodium iso- amylethyl barbiturate	71	45	4659 gm.	2500 gm.	3410 gm.	690 gm.	90 gm.	230 gm.	3.08 days	12.1 days
Sodium iso- amylethyl barbiturate intravenously	34	50	4845 gm.	2500 gm.	3437 gm.	450 gm.	120 gm.	225 gm.	3 days	11.03 days
Sodium iso- amylethyl barbiturate orally	44	61	4432 gm.	2227 gm.	3380 gm.	420 gm.	120 gm.	240 gm.	2.8 days	12.8 days

plementary feeding. In both groups there was an occasional complaint that the baby was aroused with difficulty at nursing time and nursed poorly. This occurred during the first three to seven days, about equally in the cases that had, and had not, received sodium iso-amylethyl barbiturate, and soon corrected itself. It has been possible to follow up a certain number of these babies for varying periods of time up to the eighth month. All are developing normally.

In conclusion, it appears that, in accord with other reports in the literature, sodium iso-amylethyl barbiturate has no injurious effect on the newborn child when given in the customary doses as an obstetric analgesic or anesthetic.

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4105 LIVE OAK STREET

BACTERIOLOGY OF NEWBORN WITH SPECIAL REFERENCE TO HEMOLYTIC STREPTOCOCCI

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HEMOLYTIC streptococci have been found in cultures taken from the throats and tonsils of normal children¹ and adults.² However, little has been done to determine the incidence of beta (B) hemolytic streptococci in the bacterial flora of infants' throats. With this object in mind, a study was made to determine whether or not infants' throats were sterile at birth; when the mouth cavity became inhabited by bacteria; the type of streptococci present, with special reference to the beta hemolytic type of Smith and Brown³; and finally to determine the incidence of hemolytic streptococci in normal infants' throats compared with that of adults.

According to Campo⁴ the mouth of the fetus is sterile, and Pasteur⁴ states that all the cavities of the fetus are sterile. It was of interest to find how soon, and with what type of organisms, the mouth cavity became invaded. Bonnaire and Keim,⁵ in 1900, found the mouth sterile several hours after birth, but demonstrated diplococci in the throat of one child twenty-four hours old. Streptococci were not present in infants on direct examination of swabs. The work of Bonnaire and Keim was of no assistance in determining whether or not hemolytic streptococci were present, as to the differentiation of hemolytic streptococci on blood agar was introduced by

Schottmüller⁶ in 1903. They state that suckling increased the number of species of organisms while the number of individual organisms in each species diminished.

Mine. Brailovsky-Lounkevitch⁷ in 1915 examined several infants from birth to several days of age and found the mouth liquid absolutely sterile at birth. She confirmed the work of Jeauuin,⁵ who, in 1904, reported that the buccal cavity commenced to populate itself about the sixth hour. At the tenth hour she demonstrated the organisms on direct examination of the mouth liquid. The numbers increased very rapidly after the tenth hour. Jeannin demonstrated species of staphylococci soon after birth. *Bacillus coli* was found nine hours and streptococci twelve hours after birth. Lounkevitch states that the *Streptococcus salivarius* assumes an important place by the tenth day and is constant during the first year, whereas other bacteria of the air have a tendency to disappear. Only one child had *Streptococcus pyogenes* in the throat at the tenth hour.

Bloomfield,⁸ in a series of 18 infants, reported that cultures taken before the twelfth hour revealed no organisms, except in one infant who had green streptococci. A profuse growth appeared when nursing started. The infants' throats contained *Staphylococcus albus* in 50 per cent of the cultures; *Staphylococcus aureus* was rarely found and was not constant. Streptococci, which formed small, green-producing, gray colonies, were present within twenty-four hours. The latter were found in the throats of attendants. Only one infant had the beta hemolytic streptococcus and this was found on two occasions. Bloomfield stated that nonhemolytic streptococci were present because they have adapted themselves to the mucous membranes of the upper air passages. He concluded that hemolytic streptococci were not found in infants' throats and special conditions may be necessary for the colonization of these organisms. It should be noted here that Bloomfield's method of making his cultures was to streak the surface of the blood agar plate. We have found from previous experience³ that a greater percentage of hemolytic streptococci may be demonstrated by pouring blood-agar into plates after inoculating the liquid medium.

Pilot and Tumpeer¹ in a series of 75 children varying from six weeks to ten years of age, demonstrated hemolytic streptococci in 47.7 per cent of throat cultures. However, 89.3 per cent of 28 pairs of tonsils removed from children between two and six years of age revealed hemolytic streptococci of the beta type. Hemolytic streptococci were found in the throats of two infants, each six weeks old. They concluded that the beta hemolytic streptococcus resides in the throat as well as the pneumococci, non-hemolytic streptococci of alpha type, staphylococci, diphtheroids, and gram-negative cocci, and may be dangerous secondary invaders. McCartney⁹ described the bacterial flora of healthy children as consisting of only a few colonies of alpha and beta hemolytic streptococci, the viridans type of streptococci, staphylococci, pneumococci, and gram-negative cocci. The hemolytic streptococci found in normal throats were few in number.

In our observations cultures were made from the newborn of the Research and Educational Hospital. Swab cultures were made of the surface of the infants' throats in the region of the tonsils daily or every other day during the ten-day period of their residence in the hospital. The infants were placed at the mothers' breasts after the eighth hour of life and every eight hours thereafter, until the third day when they were nursed every four hours. Insufficient breast feedings were supplemented by formula feedings of certified cows' milk diluted with water and boiled for ten minutes. After cooling, nonsterile dextrimaltose was added. The possible sources of contamination were the mother, attendants, and the supplemental feeding, which at times contained *Bacillus coli*.

The swabs were placed in sterile tubes and taken immediately to the laboratory; to each tube was added 2 c.c. of sterile saline solution and allowed to stand for twenty minutes at room temperature. Inoculations were made by dipping the swab quickly into melted aseptic blood agar. The medium¹⁰ was made by adding to meat infusion agar (2 per cent) P_H 7.6, defibrinated human blood and aseptic fluid in proportions of 0.5 c.c. of blood, and 2 c.c. of aseptic fluid to 10 c.c. of agar. Second dilutions were not necessary. When only two loopfuls of the saline were employed, usually no growth was obtained.

The plates were examined primarily for hemolytic streptococci with wide zones. We used the classification followed by Brown³ who differentiated as the beta type, hemolytic streptococci with wide zones from the less hemolytic alpha type.

Cultures were made from 32 infants' throats within the first twenty-four hours. Ten of these presented growths on the first culture. (Table I.) Cultures from Babies 18 and 93 were taken before nursing and revealed a slight growth. No streptococci were present however.

TABLE I

BABY NUMBER	AGE	FLORA
93	2 hours	Slight growth—no streptococci
18	5 hours	Slight growth—no streptococci
107	11 hours	<i>B. coli</i> , staphylococcus
28	12 hours	Hemolytic streptococcus (beta)
110	12 hours	<i>B. coli</i> , green streptococcus
112	18 hours	<i>B. coli</i>
70	20 hours	Green streptococcus
69	24 hours	Green streptococcus
91	24 hours	Green streptococcus
106	34 hours	Green and alpha streptococcus

Ten of the 24 cultures taken for the first time during the second twenty-four hours of life contained bacteria. Seven yielded green streptococci, 2 *Bacillus coli*, and 1 contained alpha type of hemolytic streptococcus.

Of cultures taken from 56 infants during the first forty-eight hours of life, 36 remained sterile, while 29 contained organisms. Of 22 cultures taken for the first time during the third twenty-four hours of life, 2 were sterile but cultures from these infants on the following day contained organisms. All the cultures taken within the first seventy-two hours contained green streptococci, except those from 2 infants which yielded streptococci of alpha type, and 1 which revealed staphylococci. Cultures from 87 of the infants yielded *Streptococcus viridans* on one or more occasions. Some infants left the hospital before repeated cultures were obtained. The infants' throats were usually sterile for the first eleven hours, after which interval, the mouth cavity became invaded by microorganisms. The majority, 66 per cent, of infants' throats remained sterile for the first forty-eight hours. After seventy-two hours, all the infants' throats contained some organisms.

The most constant organism found was the *Streptococcus viridans*. This organism was found in repeated cultures in predominating numbers and even in pure cultures. *B. coli* was recovered in several throats when infants were a few days old but rapidly disappeared in successive cultures. The supplemental milk feeding often contained *B. coli* when this organism was found in the throat. *B. coli* did not adapt itself to the mucous membranes of the throat for a long period and only one infant yielded *B. coli* on the twenty-third day. However, *B. coli* was found in 3 infants before feeding. This may be due to contamination in the birth canal, especially in labor of long duration. *Staphylococcus albus* was found frequently and varied in successive cultures from hemolytic to nonhemolytic types. Little attention was paid to the gram-negative organisms except for recognizing their presence in many of the plates.

Colonies with clear hemolytic zones, varying from 1 to 2 mm., were more frequent than the typical beta hemolytic streptococci, but were found less frequently than the *Streptococcus viridans*. None resembled *Streptococcus epidemicus*. The alpha hemolytic streptococci comprised a small number of the colonies on the plate. Twenty-nine infants' throats in the series revealed this organism at some time during the ten-day period. Hemolytic strains giving narrow and wide zones were tested for hemolysis by mixing 0.5 c.c. of a twenty-four-hour broth culture and 0.5 c.c. of a 5 per cent solution of washed human red blood corpuscles. The suspension was incubated for two hours, read, placed in the refrigerator overnight, and read again. Four of the 17 strains tested, completely hemolyzed the red blood cells and were considered to be typically the beta type. The other 13 strains were incompletely hemolyzed. The narrow zone colonies, with partial hemolysis, were then classed as alpha type. The 4 strains from Babies 19, 28, 68, and 70, with complete hemolysis, continued to grow with wide hemolytic zones. In broth cultures obtained from Babies 19 and 28 a flocculent growth appeared, from Baby 68 a homogeneous growth, and from Baby 70 a granular growth. Dextrose, maltose, salicin, and lactose were fermented, but inulin, mannite and raffinose were unchanged.

Five-tenths c.c. of the twenty-four-hour culture was injected intraperitoneally into mice. The mice injected from organisms from Babies 68 and 70 died promptly in eighteen hours. The mouse injected with strain from Baby 28 died in forty-eight hours. Culture made from heart's blood of this mouse resembled *Streptococcus epidemicus*. The mouse injected with strain from Baby 19 did not die within forty-eight hours.

The babies in whom the hemolytic streptococci of beta type were found exhibited no unusual symptoms or elevation of temperature. The streptococcus appeared on the ninth day in Baby 19. In Baby 28 the organism was found after the twelfth hour and was not seen again in the five succeeding cultures. In Baby 28, the streptococcus appeared in two successive cultures on the ninth and eleventh days. In Baby 70 the organism was demonstrated on the fifth day and was not seen again in the two following cultures.

The beta hemolytic streptococci, therefore, were infrequent during the first ten days of life in swab culture. When present, there were but few colonies. Beta hemolytic streptococci apparently were not a part of the habitual surface flora of the throat. However, this does not rule out the presence of hemolytic streptococci in the crypts of the tonsils.

Cultures were taken of Baby 80 at intervals up to forty days and the same bacterial flora was exhibited on the last day as was present on the twelfth day. Baby 61 was seen in the dispensary six weeks after leaving the hospital and the same flora was present as was noticed on the third day of life.

SUMMARY

Three hundred and eighty-seven throat cultures from 130 newborn infants were taken. Ten of 32 cultures taken during the first twenty-four hours and 20 of 56 cultures taken during the second twenty-four hours of life contained colonies of green streptococci, *B. coli*, and staphylococci.

Seventy-eight cultures taken within the first seventy-two hours of life contained organisms. Two infants' throats remained sterile but showed organisms on the following day.

Four beta type of hemolytic streptococci were found in this series, but were not present constantly.

Twenty-nine infants contained alpha type of hemolytic streptococci in

repeated cultures. Green streptococci were the most common invaders and were present most constantly.

Beta hemolytic streptococci were found rarely on the surface of infants' tonsils as compared with their frequent appearance in children and adults.

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185 NORTH WABASH AVENUE

REPORT OF A CASE OF SYMPUS APUS, A RARE FETAL ANOMALY*

BY RALPH A. REIS, M.D., AND JOSEPH L. BAER, M.D., CHICAGO, ILL.

CONGENITAL symphy is an unusual type of fetal anomaly produced by varying degrees of fusion of the lower extremities. Such a fusion presents the appearance of a fish tail and the fetus therefore resembles the mythical mermaid. This resemblance has given rise to the name "sirenomelus" or mermaid foot.

Mrs. L., a twenty-three-year-old housewife was referred by Dr. Phil A. Daly under whose care she had been for the past five years for late congenital syphilis complicated by a true lipid nephrosis. Her pregnancy was uneventful until the thirtieth week when spontaneous labor set in. Effacement and dilatation were complete in three hours and the delivery was spontaneous and uneventful. The fetus was still-born.

Gross Description of Fetus.—The fetus measured 30.5 cm. in length. The head was dolichocephalic in type. The region of the genitalia was completely covered by integument and no external genitalia were present. The anal region was also covered by an external integument and no anal opening was present. The lower extremities were represented by one limb which was double the diameter of an extremity which would correspond to the size and age of the fetus. This extremity was 10 cm. in length and terminated sharply, the end being formed by one toe, the nail of which was clearly demonstrable. In the region of the anus there was a reduplication of skin assuming the form of a small tail and measuring 0.5 cm. in length.

The subcutaneous tissue of the skull showed a large amount of partly liquid and partly clotted blood. The brain showed no abnormalities. The subarahnoid space contained a moderate amount of a reddish viscid material. The subarachnoid vessels were hyperemic.

The subcutaneous tissues of the chest contained a moderate amount of clotted blood. The lungs were atelectatic and did not float. The heart and lungs showed no congenital anomalies. The liver and spleen were normal. In place of the kidneys which were absent, two large adrenals were found which were brownish in color and measured 10 by 13 mm. in diameter. In the region of the urinary bladder there was a large cyst 15 mm. in diameter. On either side of this cyst were two other cystic masses, 18 mm. in diameter. These laterally placed cystic masses were subdivided

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into many smaller cystic masses and were, apparently, remnants of kidney structure. They were attached to the vesicle in the midline by means of small thin cords. The urethra was absent.

Both ovaries were found in the midline posterior to the large vesicle which apparently was the urinary bladder. The ovaries measured 8 mm. in length. A tube could be made out lateral to either ovary. Each tube ended in a blunt button-like thickening which was blind. The uterus and vagina were absent.

The large and small intestines were not attached to the posterior wall of the abdomen. The large intestines showed a free mesentery. The esophagus and stomach

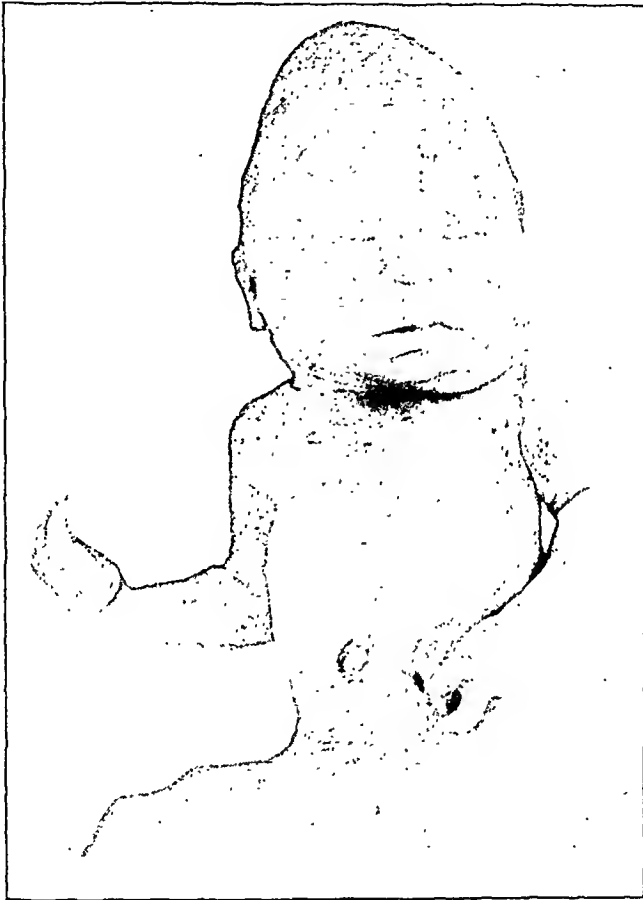


Fig. 1.—*Sympus apus*. Anterior view.

showed no abnormalities. The distal portion of the sigmoid was distended, measured 1.5 cm. in diameter, and ended blindly in the pelvic region. In the region of the rectum, there was a small tubelike structure which was attached to the perineal tissue and which ended blindly in the abdominal cavity.

The aorta and its branches showed no abnormalities.

There was a marked scoliosis of the lumbar vertebrae. The sacrum was horizontally placed. The pubic bones were attached to each other and showed no rami. The obturator foramina were easily recognizable. Both femurs could be made out. They were fused in most of their course and the condyli were also fused. Neither the tibia nor fibula of either side was recognizable. There was one os tarsum and three ossa metatarsalia present, corresponding to the one toe.

Diagnosis.—*Sympus apus*, atresia of anus and rectum, agnesia of the uterus and vagina and congenital anomalies of the kidneys.

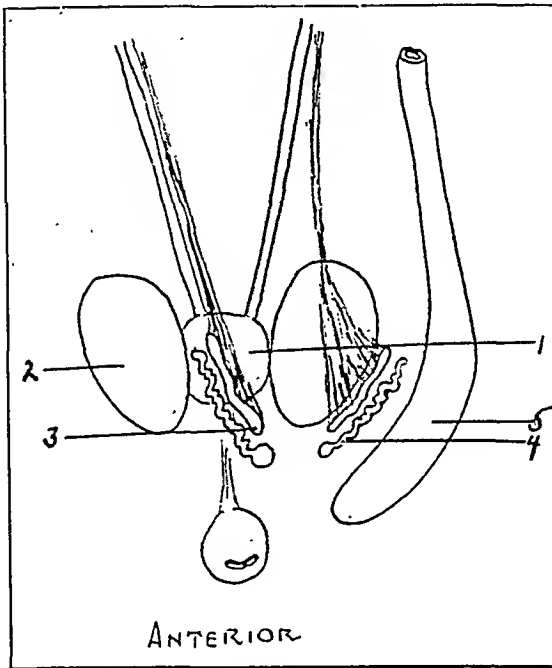


Fig. 2.—Sympus apus. Sketch of pelvic organs. 1, Urinary bladder; 2, cystic kidney; 3, ovary; 4, fallopian tube; 5, sigmoid ending in blind pouch.

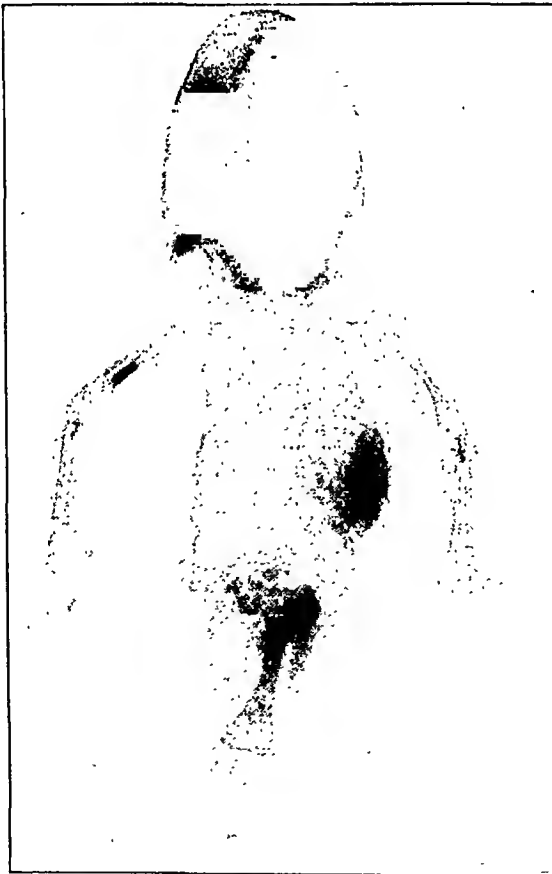


Fig. 3.—Sympus apus. Roentgenogram. Note the pelvic anomalies, the fused femurs and the absence of both tibiae and fibulae, the tarsal bones and the metatarsal bones of four toes.

Comment.—There are three distinct types of congenital symphydia described in the literature. Symphydia diaphys shows a fusion of the lower extremities due to a fusion of the soft tissues but with two distinct and separate feet. Symphydia monopodia shows a complete fusion, including the feet but with two distinct sets of the bones of the lower extremities. The third type, symphydia apodia, has in addition to the complete fusion of the lower extremities, a congenital absence of both feet. All the types of symphydia show characteristic malformations of the pelvic bones and lower spine. The specimen here reported fits the description of this third type and must therefore be classified as a symphydia apodia. It has in addition to the symphydia a horizontally placed sacrum and the typical malformations of the pelvic bones.

Birnbaum, Schwalbe, Lenz, Lange, Bauereisen and Ballantyne have all reported cases of symphydia but every case found in the literature showed two complete sets of bones of the lower extremities. This case seems to be unique in that the femurs were united and practically all the other bones of the lower extremities were missing.

104 SOUTH MICHIGAN AVENUE

A PRELIMINARY REPORT ON THE USE OF SODIUM AMYTAL AND SCOPOLAMINE ANESTHESIA DURING LABOR

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THE various methods of inducing analgesia and amnesia during labor in present use at the Boston Lying-in Hospital are by means of pantopon and scopolamine and either continuous or intermittent gas-oxygen. Pantopon and scopolamine are used only in primiparae and are fairly satisfactory, but they do not produce complete amnesia in the majority of cases and have the disadvantage of occasionally affecting the baby if given late. Gas-oxygen used in primiparae and multiparae is extremely expensive and requires the constant attention of a trained anesthetist or of a physician. In an effort to eliminate the disadvantages of the present methods and at the same time to retain their advantages a study was instituted of sodium amytal and scopolamine in one hundred unselected cases.

We have used sodium amytal in capsules given by mouth and found it to be an excellent sedative, both in cases which require rest and sleep and as a preoperative measure. Used alone during labor, however, it does not produce amnesia. Our patients remembered pains although they rested and slept during the interval. Sodium amytal alone given by mouth is not as effective as pantopon and scopolamine. We have used sodium amytal intravenously in a few cases and found it to be unsatisfactory, since the patients all became very irrational and impossible to manage. In the effort to produce complete amnesia, we decided to combine scopolamine, given subcutaneously, with sodium amytal, given by mouth.

A standard initial dose of sodium amytal, gr. ix, followed in half an hour by scopolamine, gr. 1/100, for a patient weighing one hundred and

thirty pounds was agreed upon and was considered safe for a person of this size. For a patient weighing less we have tried sodium amytal, gr. vi, as the initial dose, and for those weighing over one hundred and ninety pounds we have given sodium amytal, gr. xii. Our series included 51 primiparae and 49 multiparae and the method worked equally well in both types of cases, provided medication was started early enough in labor.

The average duration of labor for multiparae was less than five hours; for primiparae less than ten hours. In this series of 100 cases, medication was started when the dilatation in 45 patients was one and one-half fingers; in 29 patients, one and one-half to two fingers, and in 26 patients, two and one-half fingers or more. We have found that patients who are delivered in less than two hours from the time of the first medication are less likely to have amnesia than those treated early; whereas the patients seen early in labor and treated immediately had excellent amnesia, although in some cases it was necessary to repeat the medication.

The standard initial dose was given to 51 patients. An additional dose of sodium amytal, gr. iii, and scopolamine, gr. 1/150, was given to 29 patients who were in labor over three hours. The medication was given when the patient seemed too rational for a perfect end-result. This conclusion was arrived at with difficulty, because some of our patients seemed quite rational and yet had complete amnesia. One of our patients, a multipara, in labor 15 hours, seemed resistant to the medication and the initial dose was followed in three hours by sodium amytal, gr. vi, and scopolamine, gr. 1/150, which was repeated in about three hours. There was no ill effect noted with this dosage to either the mother or the infant. In 6 patients, each weighing less than one hundred and twenty pounds, sodium amytal, gr. vi, and scopolamine, gr. 1/100, did not, according to our observations, give as satisfactory effect as when a standard initial dose was given.

Not all of these cases were normal. In the series there were several patients with rheumatic heart disease and mitral stenosis, a few women had tuberculosis, and in some instances stimulation with pituitary extract was necessary. One of the tuberculous patients had a breech extraction without general anesthesia and had complete amnesia. On another tuberculous patient a dilatation and curettage was performed without any general anesthetics and with equally good results. We feel that our results are very gratifying, since most of our patients state that they remember absolutely nothing.

In classifying our results, we counted those who had complete loss of memory from the time of medication 100 per cent effect; those who seemed to us to have been irrational during labor yet who said their memory of labor was vague and that they remembered slightly some of their pains, 75 per cent (fair result); those who remembered more than this latter group we considered failures.

Eighty-four of the patients in this series fall into the 100 per cent

group; 10 of the patients fall in the 75 per cent group; and 6 fall in the failure group. We believe it only fair to say that the 10 patients in the 75 per cent group had results as satisfactory as those we are accustomed to seeing with the use of pantopon and seopolamine. As was mentioned above, of the 6 failures, 4 were given medication when the cervix was fairly well taken up, were soon in the second stage of labor, and were delivered before two hours had elapsed. The remaining two failures were primiparae delivered in less than three hours. We believe it is justifiable to say that these last 6 cases were too far advanced in labor for perfect results to be expected, and should have had gas-oxygen. Several similar patients however, who were delivered in less than three hours, had complete amnesia. Some patients seemed to be definitely more susceptible to sodium amytal than others, and this may also account for some of the differences.

In comparing pantopon and seopolamine with sodium amytal and seopolamine the determination of the exact condition of the cervix is essential for a perfect end-result in either case. Pantopon and seopolamine when given early may stop labor; sodium amytal will not. Pantopon and seopolamine when given late may produce a sluggish baby; sodium amytal will not. Pantopon and seopolamine are used chiefly for primiparae, less often for multiparae; sodium amytal and seopolamine may be used equally well for both. Pantopon and seopolamine, in our clinic have not been as effective in producing amnesia as sodium amytal and seopolamine.

Studies of this series so far have shown that there is no appreciable fall in blood pressure, no added postpartum hemorrhage, no respiratory or cardiac effect, no effect on the babies, and the necessary amount of gas-oxygen and ether at the time of delivery is markedly reduced. Detailed studies of the above are to be given in a subsequent paper.

There is one disadvantage from the nursing standpoint; namely, a few patients become quite restless particularly during the second stage of labor and have to be watched carefully. However, this can be easily done. The less the patient is restrained, the less irritable she will be, and we have found that it is of utmost importance to impress this on the attendant. No patient who has been given this combination of drugs should ever be left unattended. In our series there were 4 patients who were definitely irrational. A few breaths of drop ether were given and the patients immediately quieted down, labor continued, and they delivered several hours later.

An advantage that has not been mentioned and yet one which seems to me extremely important is that the patients sleep several hours after delivery. They rarely awaken until several hours after they have been returned to their rooms. Primiparae, as well as multiparae, will frequently ask some six to twelve hours after delivery when they will have their

baby and are extremely surprised as well as happy that the dread ordeal is over.

Another advantage is that when desirable a patient may be given the first dose in her room. When this has become effective, she may be moved to the delivery floor for further medication and delivery, later returning to her room without knowledge of having left it.

SUMMARY

Sodium amytal and scopolamine cause complete amnesia in the majority of cases, if given early. It can be given much earlier than pantopon and scopolamine with much better results. It can be given late in labor without untoward effect but is best given early. It does not slow labor or affect the baby. This combination saves general anesthesia and is far less expensive. Patients sleep several hours after delivery.

THE VALUE OF KIDNEY VISUALIZATION IN PREGNANCY A PRELIMINARY REPORT*

BY E. L. CORNELL, M.D., AND C. H. WARFIELD, M.D., CHICAGO, ILL.

KIDNEY and bladder complications occur often enough for the obstetrician to welcome the new drugs used to visualize the urinary tract.

Since February, 1931, on the obstetric service of the senior author at the Cook County Hospital, x-ray examinations have been made of all urinary tract complications during pregnancy and the puerperium. We have also taken films of apparently normal pregnant women. While this subject has not been thoroughly exploited, the results warrant this preliminary report.

Normal pregnant women, who have no complaints referable to the urinary system, may show a marked dilatation of the right ureter. This is many times accompanied by kinks which are located in the upper half of the ureter. From the roentgenogram, one would think that these were more than twists in the ureter. They seem to be reduplications in some instances, while in others they are more or less right-angled foldings. We have found no strictures in the ureter up to the present time, nor have we seen any evidence of stone. The left ureter shows a dilatation to a much lesser degree and only occasionally have we seen kinks. The ureter on the right side shows evidence of dilatation from the third month on.

The ureters became visualized to the level of the fifth lumbar vertebra but were seldom seen lower. All cases of hydronephrosis showed hydroureters. Two pregnant women showed displacement of the ureter by the uterus. In all cases the bladder has been saddle-shaped. This is so, re-

*Submitted for publication, July 6, 1931.

ardless of whether the baby lies in a breech or cephalic presentation and is seen as early as two and a half months. It is seen in roentgenograms taken ten minutes after the injection of skiodan.

It was thought that the saddle-shaped bladder might be a diagnostic point in pregnancy but on using skiodan in a case of a large uterine fibroid, it was found that the bladder assumed an even more marked saddle-shape. One must conclude that the weight of the uterus is the cause for the shape assumed by the bladder.



Fig. 1.—Case 15692. Patient aged seventeen, para 0, grav. i, L.M.P. December 13, 1930. Admitted April 22, 1931 complaining of pain in the back and right loin, chills and fever of four days' duration. Temperature 101.4° F., urine showed 4+ albumin and many pus cells. Diagnosis: right-sided pyelitis. Patient was given skiodan the next day. She had a slight chill while it was being injected. This roentgenogram was taken ten minutes after injection.

In patients with cystitis or pyelitis, we invariably found a marked kinking in one or both ureters, and also marked dilatation. Pyelograms have been made in a number of instances and those have confirmed the diagnosis made by using skiodan intravenously.

Skiodan was the drug used in all cases, 20 gm. dissolved in 50 c.c. of sterile water being the dose used. The drug is now supplied in containers ready for use. Films were exposed ten minutes, thirty minutes, one hour, and four hours after the injection. In only two patients were there any reactions. In each of these there was a complicating pyelitis with a



Fig. 2.—Case 15692. Roentgenogram taken thirty minutes after injection.



Fig. 3.—Case 15692. Roentgenogram taken an hour and a half after injection. Note the marked kinking in both ureters, the right being more pronounced than the left. There is a marked dilatation in the right ureter.



Fig. 4.—Case 15692. Roentgenogram taken three hours after injection.



Fig. 5.—Case 14310. Patient aged thirty, para i, grav. ii, had a normal pregnancy of seven months' duration. She had no kidney complaints. The roentgenogram was taken three hours after the injection. Note the retention of the dye after this long period.

temperature 102° to 104° F. Each patient complained of a slight chill which lasted only a few minutes. One of these patients seemed to have a therapeutic effect from the drug, all symptoms of pain and temperature subsiding in forty-eight hours. Whether this was a coincidence is difficult to state.

The pathologic kidney is slow to visualize as compared to the normal and it retains the opaque material much longer. Good shadows of the pathologic side were seen as long as three hours after injection. Normal kidneys showed the best visualization in ten minutes after injection.

The only drawback to taking roentgenograms of the urinary tract in this manner is the inability to visualize the pelvic portion of the ureter. We have tried to show it with the urinary bladder full, partially full, and empty, but so far we have not been consistently successful. We also used the Trendelenberg position with no success.

At present the senior author feels that visualization of the urinary tract in normal pregnant women may show that accepted facts will have to be revised.

Again, it offers a means of confirming urinary tract disease diagnosis without great discomfort to the patient and at less cost. It further allows the obstetrician to decide more accurately whether or not a patient should be examined with the cystoscope or catheterized. The distressing complication of hydronephrosis can be easily recognized without instrumentation.

122 S. MICHIGAN AVENUE

Vogt, E.: Fetus and Vitamin A. München. med. Wchnschr. 42: 1748, 1929.

Vogt calls attention to the importance of vitamin A in metabolism and growth, and refers to the effects of feeding young animals with a diet in which vitamin A is absent, namely, cessation of growth, loss of weight, xerophthalmia and keratomalacia. He discusses the close relationship existing between the vitamins and the endocrines.

Vogt details the results of experiments made to determine the amount of vitamin A in the various organs of the fetus during the latter half of pregnancy. Instead of using feeding experiments in this work, he utilized the color reaction devised by Rosenheim and Drummond with antimony trichloride. By means of this test on 8 fetuses varying in age from five to nine months, he found vitamin A stored in the liver only, and not present in other organs. He concludes that the liver is the chief organ for storage and metabolism of vitamins in the fetus.

A. SHULMAN.

Society Transactions

CHICAGO GYNECOLOGICAL SOCIETY

STATED MEETING, JUNE 19, 1931

DR. HARRY W. FINK reported a case of **Rupture of a Pregnant Uterus Into the Bladder.**

The specimen is from a colored woman aged thirty, who when four months pregnant fell down a flight of stairs. Two days later the hematuria, which began soon after the accident, became more marked and urination frequent and painful, accompanied by considerable distress in the lower abdomen. She was admitted to the hospital on September 23, 1928, and for a short time she seemed to improve on expectant treatment. The blood count was as follows: Red blood cells 4,850,000, white blood cells 14,600, hemoglobin 75 per cent. She belonged to Group 4. On the morning following admission she developed signs of alarming internal hemorrhage. The abdomen was not rigid but there was a mass corresponding to a gravid uterus extending to the umbilicus. It was smooth and firm. It was possible to feel a small mass slightly posterior in the fundus. The blood picture had changed so that the red blood cells were 3,500,000 and hemoglobin 60 per cent. The cervix was edematous and pale in color. The os was not open and there was no evidence of hemorrhage. X-ray showed only the presence of a mass in the abdomen corresponding to the physical findings. Several grams of bloody urine were removed by catheter. A cystoscope was then inserted and air injected. It returned around the cystoscope and a second x-ray failed to show the presence of air in the peritoneal cavity. Further distention of the bladder was not performed. The diagnosis at this time was ruptured gravid uterus associated with a dissecting hematoma, involving the posterior wall of the bladder. Because of the patient's weakened condition, the very evident shock, and progressive hemorrhage, she was a poor surgical risk. She was given a blood transfusion by the direct method but died a few hours later. An autopsy was performed and the anatomical diagnosis was as follows: Ruptured pregnant uterus into the posterior bladder wall; large hematoma of the urinary bladder (3000 gm. of blood clot); pregnancy of about four months' duration; old adhesions between the posterior bladder wall and the anterior uterine wall with marked thinning of both; adhesions between the bladder and anterior abdominal wall; and old healed midline laparotomy scar.

In reviewing the patient's past history, it was found irrelevant except as it pertained to her pregnancies and to a previous gynecologic operation about one year before her accident. She had been pregnant four times. The first two resulted in miscarriages at six weeks and four months respectively. She had been told during her second pregnancy that she had a fibroid. During her third pregnancy at three months and with a fibroid, she was operated upon. The findings were a pregnant uterus and a large fibroid the size of a grapefruit extending from the left horn of the uterus. The uterus was studded with small fibroids, varying from the size of a pea to that of a pecan nut. A myomectomy was done, the large fibroid being removed by excision and numerous small fibroids shelled out. The pregnancy was terminated and all placental tissue removed, after which the uterus was sutured and the abdomen closed in layers. The general postoperative condition was negative except for several stitch infections necessitating a stay in the hospital of twenty-seven days.

It is presumed that the trauma one year later was sufficient to produce a rupture of the pregnant uterus through one of the weakened scars in that organ.

DR. SOL LITT reported a case of **Double Uterus**.

S. T. a girl fourteen and one-half years of age, entered the Michael Reese Hospital on June 3, 1931, complaining of excessive vaginal bleeding for the past seven months. The menses began at thirteen years, were regular every 30 days and lasted five to six days for the first seven months. The last normal period was in November, 1930. Three weeks later the patient had a severe hemorrhage from the genitalia lasting three days. Since then she flowed every two weeks for six to seven days with spotting in the intervals.

The past history was not significant. Physical examination revealed a large, well developed girl appearing older than fourteen years and weighing 67.74 kilograms. General examination was negative. The introitus readily permitted vaginal examination which revealed a cystic mass 3 by 4 cm. in diameter in the anterior vaginal wall encroaching on the vaginal canal and obliterating the anterior fornix. The cervix was behind the mass. The adnexa were normal to palpation. The provisional diagnosis was congenital cyst of the vaginal wall, possibly Gärtner type.

In order to visualize the corpus uteri and appendages, a transuterine pneumoperitoneum and lipiodol instillation was performed. The interpretation of the film was unicorn uterus with right tube patent.

On June 13 an operation under spinal anesthesia was performed by Dr. Laekner. A left paravaginal incision was made, and the vaginal mucosa over the cystic mass incised and dissected away. In attempting to free the mass from the anterior wall of the cervix, the tumor was opened and about 100 c.c. of tarry black material escaped. The dissection was completed and a double uterus was found. There was no connection between the two uteri. The internal os of the left uterus was represented by a deep constriction and communicated with the sacculated hematocervix which protruded downwards and anteriorly in front of the cervix of the right uterus and formed the mass felt vaginally. The right uterus deviated sharply to the right and was connected to the vagina by the cervix. The urinary bladder was situated in the depression between the two uteri. Each uterus had a tube extending from its cornu. Two ovaries were present, each in normal relation to its tube. The left hematocervix and uterus were excised, leaving the tube and ovary. The right uterus, tube, and ovary were left in situ.

DRS. RALPH A. REIS AND JOSEPH L. BAER presented a paper entitled **Separation of the Symphysis Pubis Following Spontaneous Labor**.

DR. SAMUEL KAPLAN (by invitation) presented a paper entitled **Blood Chemistry Study in Normal Pregnancy and Eclampsogenic Toxemia**. (See page 673.)

DR. R. A. LIFVENDAHL presented a paper entitled **Modifications of the Hormone Tests for the Diagnosis of Pregnancy**. (For original article see page 721.)

DISCUSSION

DR. SYDNEY S. SCHOCHET.—We are not blind to the virtues of all these tests, but it seems to me that the gynecologists are losing sight of the fact that the clinical history and physical findings are often sufficient to make an early diagnosis of pregnancy. Chipman called attention many years ago to the softening of the uterus

and undue pulsation of the uterine vessels in very early pregnancy. This with the classical textbook findings should suffice in the making of a diagnosis of pregnancy. These tests may be essential in certain cases and play an important rôle in the diagnosis but to make it a routine procedure is not to be sanctioned. This test is exceedingly valuable in cases of chorionepithelioma.

DR. EDWARD L. CORNELL.—At the Cook County Hospital, we used the Schneider test in 14 cases of pregnancy and one of hydatid mole, 15 cases in all.

The hydatid mole gave a very strongly positive result. A week afterwards we re-tested the same patient and the test was still strongly positive. I made a diagnosis of chorionepithelioma which was later confirmed. I want to record two failures. One woman apparently had a three months' pregnancy complicated by a fibroid tumor. The report came back after thirty-six hours negative. I saw the ovaries and there were absolutely no hemorrhage of any character. The rabbits had received 5 c.c. of urine. On those findings the surgeon operated. He made a diagnosis of pregnancy complicated by a fibroid and closed the abdomen. The test was made last March and the patient was still pregnant at the time of reporting. The second patient had a tumor the size of a four and one-half months' pregnancy. We used the test as a routine but also checked her with the x-ray. The films showed a fetus. The test was negative in the rabbit. From these findings we decided that the rabbit test was not as accurate as it might be.

DR. P. F. SCHNEIDER.—In the use of this test it seems there is a certain unavoidable percentage of error. To avoid that and not cause serious mistakes it seems advisable to follow the suggestion of Dr. Schochet and use the clinical history and physical findings to check the test. Occasionally the source of error can be traced to the rabbit. Some rabbits have very small flat ovaries which have no visible graafian follicles. If at autopsy flat ovaries are found, it should be known that the animal is not a proper test animal and another animal should be used and the test repeated.

The test has its limitations. In a series of between 400 and 500 cases, we have had three cases in which a positive diagnosis was made before the patient had even missed a period. On the other hand, there were several cases in which a negative diagnosis was obtained five to seven days after a menstrual period had been missed. Repetition of the test several days later gave a positive result in each instance. This indicates, with some other cases in which we knew the definite date of the intercourse responsible for the pregnancy, that the reaction becomes positive about three weeks following the date of intercourse.

DR. ALFONS BACON.—After deducting our initial failures (9 cases) with the Aschheim-Zondek test and deducting 29 more for failure to submit reports because of death of the mice and inability of obtaining follow-up reports, I will report on 76 cases in which the reports were later confirmed by the patients or doctors. In cases in which the mice died, the cause was almost always to be found in cystitis or a pyelitis or the specimens had been sent through the mail and became highly toxic. Of the 76 cases, 37 or 49 per cent were positive, which were correct; 34, or 45 per cent, were negative, which were correct, and 5, or 6 per cent, were incorrect reports. Of the incorrect reports all but one were negative which should have been positive. The single exception (number 42) was in the case of a woman of forty-five who was going through the menopause and in her case only one of the four mice used showed a true positive reaction.

I have included in these figures a few special cases which I wish to mention.

Number 43 was a patient with a hydatid mole who had been curetted a few days previously and she gave an unusually strong positive reaction. This, of course, was to be expected.

Number 46 was the same patient two weeks after the eurettement. It was like a normal positive reaction.

Number 55 was the same patient six weeks after operation and the result was negative. In this case we made a diagnosis of no chorionepithelioma developing.

Number 84 was another case of hydatid mole, two weeks after operation, which gave a negative reaction. In this case the same diagnosis was made.

Number 99 was a case of missed abortion done seventeen days after the initial hemorrhage, giving a negative result. The curettage following the test confirmed this result.

We also had a case (number 94) similar to the one Dr. Cornell reported, where the diagnosis of pregnancy with fibroid was made with the aid of this test. When we operated, we found this to be correct. In several cases we have had the opportunity, because of negative reports, to save patients from operations which had been planned on account of suspected pregnancies.

Another suggested application of this test is in case of sterility after performing a tubal insufflation, when, for fear of disturbing a pregnancy which may have just started, this test is applicable in helping to determine whether another insufflation may be attempted or not.

In looking over our figures, I find the majority of incorrect results to be among the first half of the cases I have just reported. From several cases we have learned that individual mice will not react true to form; hence, the advisability of using several of these test animals. I cannot see why such experiences may not occur with other test animals.

DR. SIDNEY KLEIN.—In reviewing the literature, I found but five cases reported of ectopic pregnancy with positive A-Z tests. I then reported one and Dr. Davis two; so, to date, there are eight cases with positive results.

DR. R. A. LIFVENDAHL (closing).—Whatever the method of exposure, it should be kept in mind that little manipulation of the ovary or its blood supply should be done in order not to produce artefacts.

Repeated use of the animals calls for certain precautions. If the ovary has responded with a positive reaction the animal should not be used for at least a period of three weeks. Experimentally, it has been demonstrated that the hemorrhagic bodies have an inhibitory effect upon the development of further pseudopregnancy reactions for this period of time.

Dr. Priest's suggestion of isolation of the rabbit for at least ten hours before performing the test is well taken, and I agree that this precaution should be carried out. I have used sodium amytal and chloroform but these forms of anesthesia, in my hands, have not proved as satisfactory as ether.

DR. WILLIAM A. SIMUNICH presented a paper entitled **A Comparison of the Sedimentation and Ruge Virulence Tests in 150 Gynecologic Cases.** (For original article see page 724.)

Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Collective Review

A Critical Review of the Obstetric Literature of 1931

J. P. GREENHILL, M.D., CHICAGO, ILL.

AS THE title indicates the review this year is more critical and, to avoid undue length, was made less comprehensive. The outstanding papers of the year were Williams' contribution on the disappearance of the placental site, the symposium of papers presented at the White House Conference on Child Health and Protection, the symposium on resuscitation of the newborn presented before the New York Obstetrical Society, articles devoted to improvements on the original Aschheim-Zondek test, and the physiologic experiments of Ivy, Rudolph, Hartman and Koff on the uterus of dogs and monkeys.

PREGNANCY

Physiology.—In a discussion of the tetanoid syndrome in obstetrics Hartley¹ emphasizes that there are five symptoms in this syndrome namely, cramplike pains in the legs and thighs, irritability of disposition unusual in the patient, insomnia, parasthesias of the extremities and often edema of the extremities apparently not associated with cardiac or renal disturbances. The author is of the opinion that women who have menstrual cramps nearly always suffer from one or more of these symptoms in pregnancy. Richardson² believes that 75 per cent of all pregnant women suffer from tetany, the treatment for which is the administration of calcium best accomplished by taking viosterol. He maintains that viosterol administered during pregnancy will prevent and cure tetany, lessen the toxemias of pregnancy, improve friable perineums, prevent postpartum hemorrhage, improve the condition of the teeth, and decrease the coagulation time in the newborn. (There is no doubt that viosterol, irradiated ergosterol, is a valuable substance. Richardson is perhaps a little too enthusiastic, but all of us who prescribe this preparation know that it does help enormously women who have symptoms of tetany and also those who have trouble with their teeth. I usually prescribe thirty drops a day. In addition to taking viosterol, the patients are asked to drink a good deal of milk and eat sun-wheat cookies in order to increase the amount of calcium in their diet. If necessary, calcium gluconate is prescribed as this is probably the most pleasant and most assimilable form of calcium taken orally.)

Jarcho³ and also Liepmann⁴ discuss the value of roentgenography in obstetrics; Thoms⁵ and also Walton⁶ take up the question of roentgenologic pelvimetry and intranterine cephalometry, and Kehr⁷ writes on the detection of fetal death in utero by means of x-ray. (In spite of

the fact that roentgenography is only thirty-five years old, almost miraculous strides have been made in this field. Obstetricians were rather tardy in utilizing this valuable aid and the first extensive work in obstetrics was the atlas published by Warnekros in 1917. During the last few years roentgenography has been used extensively in obstetrics for the following purposes: (1) to make a positive diagnosis of gestation in doubtful cases in the early months, either as flat or stereoscopic plates or combined with transabdominal pneumoperitoneum; (2) to detect twins or triplets; (3) to reveal monstrosities in utero; (4) to determine the presence of an ectopic pregnancy [then combined with transabdominal pneumoperitoneum or the injection of lipiodol]; (5) to rule out pregnancy in the presence of fibroids or other tumors; (6) for the exact diagnosis of presentation and position; (7) as an aid in the study of the mechanism of labor. Not only may the first and second stages be studied but also the third stage after injecting the umbilical cord vessels with an opaque substance; (8) to study the size of the fetal head and the pelvic inlet with a view of detecting disproportion; (9) to determine the death of a fetus in utero; (10) to study the changes in the urinary tract [kidney pelvis, ureters, bladder, and urethra] during gestation; (11) to study the alterations in the symphysis pubis and sacroiliac joints; (12) to follow the changes in the position of the appendix and the base of the cecum during pregnancy, and (13) to detect abnormalities in the newborn.)

The Aschheim-Zondek test continues to be a source of study not only for obstetricians but also for a large number of laboratory investigators. Many papers on this subject were published during 1931 and among the more important ones are those by Ehrhardt⁸ based upon 2,000 tests; Wiesner,⁹ 835 cases; Frank, Goldberger and Felshin,¹⁰ 321 tests; Eberson and Silverberg,¹¹ 175 cases; Ettinger, Smith and McHenry,¹² 137 cases; Stewart,¹³ 101 cases; Finkel,¹⁴ 52 cases; Hauptstein,¹⁵ 50 cases, and v. Ammon.¹⁶

Friedman and Lapham¹⁷ suggest an improvement over the Aschheim-Zondek test which consists in the use of one unmated mature female rabbit instead of five immature mice. Their test is completed in less than forty-eight hours, whereas the Aschheim-Zondek test usually requires one hundred hours. Others who verified the superiority of the Friedman test are Davis and Walker,¹⁸ Magath and Randall,¹⁹ Schneider,²⁰ Reinhart and Scott,²¹ and Wilson and Corner.²²

Brouha and Hinglais²³ report on their test in which they use male guinea pigs instead of female ones, Mathieu and McKenzie²⁴ recommend the use of one female rat instead of five female mice, and Bonrg²⁵ advocates carrying out the test using one male and one female rat at the same time. Mazer and Hoffman²⁶ report a comparison of the Aschheim-Zondek test, the female sex hormone test and the Siddall test. Gordon and Emmer²⁷ discuss the Bereovitz test for pregnancy, Kulitzky²⁸ studied the so-called erythrocyte sign of early pregnancy and a large number of foreign investigators reported on the Manoilov pregnancy reaction (Dierks,²⁹ Nerson,³⁰ Zelig,³¹ Goldschmidt-Fürstner,³² Luh,³³ Gymnich,³⁴ Moschkow³⁵ and Kabisch³⁶). White and Severance³⁷ compared the following pregnancy tests; Aschheim-Zondek, Brouha, Friedman, Manoilov and Bereovitz. Sellheim³⁸ traces the attempts at making a diagnosis of early pregnancy from the clinical studies of Hegar through the labora-

tory tests of Abderhalden up to the results obtained by Aschheim. (The foregoing array of names, tests and modifications indicates the enormous amount of laboratory work that is being done at the present time in the attempt to make an early diagnosis of pregnancy. In spite of their relative newness the Aschheim-Zondek and the Friedman tests have definitely proved to be reliable in about 98 per cent of cases. The Bereovitz pupillary test is dependable in a much smaller percentage, whereas the Manoilov test is very unreliable in the first few months of pregnancy. The many thousands of pregnancy tests which are being performed and the innumerable animals which are being sacrificed can only be excused on the ground that the tests are relatively new and every laboratory worker wants to verify their dependability and perfect himself in their technique; for it is hard to conceive that in so many cases of normal pregnancy a diagnosis cannot be made clinically or that there is such urgency for prompt diagnosis. Early intrauterine pregnancy can still be detected in the large proportion of cases by means of bimanual examination, especially if the examination is repeated after two or three weeks. In abnormal gestations of course, these tests are invaluable. In this category belong extrauterine pregnancy, missed abortion, incomplete abortion, hydatid mole, and chorionepithelioma. When a physician is given a specimen of urine and asked to have a hormone test of pregnancy performed, he should make sure he knows the source of the urine. Likewise it is important to whom and how he communicates the result of the test.)

Abortion.—In an elaborate paper on the relationship between abortion and fetal and maternal welfare, Taussig³⁹ calls attention to the fact that there are approximately 700,000 abortions annually in the United States, that the number is increasing each decade and that most of the women who have abortions are married women. He believes that 15,000 women die each year as the result of abortions. The deaths from sepsis following abortion are seven times as frequent as after childbirth. In a series of 600 abortions reviewed by Hendry⁴⁰ it was found that by far the largest number were self-induced. Likewise Harbitz⁴¹ believes that the majority of the 3,791 cases of abortion treated at the Oslo Municipal Hospital were most likely criminal in origin. In the febrile cases the death rate was ten times as high as among the afebrile cases. McConnell⁴² is of the opinion that among the factors causing abortion, infections probably play the greatest rôle. According to Peller⁴³ there are presumably one million or more abortions annually in Germany. In large cities approximately 50 per cent of all pregnancies end in abortion but this does not mean that all the abortions are induced. According to Magid⁴⁴ there are about 400-500,000 spontaneous abortions in Russia each year. This number represents an average of 7.5 per cent of all conceptions. On the tenth anniversary of the legalization of abortion in Russia (November 20, 1930) Boyko⁴⁵ made an extensive study of abortions. Russia is the only country in the world where abortion is legalized and every woman has the right to request that it be performed if there are any indications of a social nature. The claim was made that this law would lead to a degeneration of the nation but the author disproves this assertion. In 1929 the net increase in population of Russia was 23 per thousand while in France it was only 1.3 and in England 3.4. (The above figures give an idea of the appalling number of abortions which occur throughout the world. While there has been an increase

in the incidence of spontaneous abortions, the vast majority of the early interruptions of pregnancy are induced. The exact number of the latter will most likely never be known nor will the totality of unnecessary deaths which result from it. However strongly we might condemn the Russian law concerning abortions, it certainly has resulted in a distinct decrease in the mortality following abortions; according to the law, abortions must be performed in hospitals which are, of course, far cleaner than the offices of most abortionists. Regardless of how much we try to educate women to the dangers of criminal abortion, countless numbers of them still continue to go to doctors and midwives who secretly perform abortions in unclean surroundings. The women have very little fear or at least they are willing to take a chance because they are desperate and the abortionists themselves have no regard for civil law, moral code or religion. The problem of induced [this is a better word than criminal] abortions requires further studies like that made by Taussig and conferences between physicians, law-makers, ministers, and sociologists with a view toward changing our existing laws on this matter. It is true that the proper use of contraceptive measures will reduce the number of abortions, but for many reasons this information is not being used by a large proportion of women. Furthermore, we know of no anticonceptual method which is infallible.)

Leunbach⁴⁶ and also Wolf⁴⁷ advocate the use of a paste which is inserted into the uterine cavity for the purpose of inducing abortions. (These authors and others have extolled this simple procedure which was first suggested by a druggist. However, physicians should be warned against using this paste which, because of the simplicity of its use may make it popular for producing abortions. Within a short time recently, 21 women died of embolus following the use of these pastes. Most of the deaths were due to air or fat embolism.)

Complications.—Daly and Strouse⁴⁸ discuss three important medical complications of pregnancy, namely, diabetes, heart disease and hyperthyroidism. They insist that when a woman with a medical ailment becomes pregnant, the gestation should be considered as the complication and the medical ailment the paramount issue instead of the reverse. Peekham⁴⁹ takes up the treatment of diabetes mellitus associated with pregnancy. McIlroy and Rendel⁵⁰ emphasize that efficient treatment of heart disease complicated by pregnancy depends upon early antenatal examination and the cooperation of the obstetrician and the cardiologist. (This latter point is to be especially stressed, because in every case where a medical complication is associated with pregnancy, it is important to call an internist in consultation, particularly one who has had experience in treating these complications in pregnant women. Practically every maternity hospital in this country has a staff of internists to supervise the care of obstetric patients who have medical complications.)

Mussey and Plummer⁵¹ take up the treatment of goiter complicating pregnancy, and they analyze the results in 29 cases of exophthalmic goiter and in 12 cases of adenomatous goiter. In 22 of the 29 patients of the first group and in 9 of the 12 of the latter, partial thyroidectomy was performed during pregnancy. There were no maternal deaths during gestation or as the result of delivery. (Fortunately hyperthyroidism complicating pregnancy is very unusual. Most patients can be carried through gestation on Lugol's solution but when the thyroid intoxication becomes worse in spite of medical treatment there should be no

hesitation in advising partial thyroidectomy. There is far less danger of interruption of pregnancy following this operation than there is if the hyperthyroidism increased in severity. The heart must be closely watched in all patients with hyperthyroidism. It is often wise to give prophylactically pregnant women some form of iodine throughout gestation especially those who live in goiter districts.)

Kessler⁵² is of the opinion that pulmonary tuberculosis is by far too often taken as an indication for interruption of pregnancy. He believes that for a tuberculous gravida, sanitarium treatment is necessary. Robinson⁵³ received 200 letters from all over the world in answer to a questionnaire on the influence of childbearing on pulmonary tuberculosis. Most of the experts who answered agreed that parturition involves a special risk for the tuberculous woman. The injurious effect commonly begins in late pregnancy, but increases during the puerperium and reaches its maximum when lactation has been established. On the other hand, it is the firm belief of Blisnjanskaja⁵⁴ that the course of pregnancy, labor and the puerperium in tuberculosis women does not differ from that in nontuberculous individuals. From a study of the literature Fink⁵⁵ comes to the conclusion that the teaching which favors emptying of the uterus in every case of laryngeal tuberculosis is fallacious. Among 360 cases reported in the literature, 75 women recovered. Furthermore, only 33 recovered after interruption of gestation as compared with 42 who were saved without any intervention. (Within recent years most obstetricians and phthisiologists have become conservative in the care of pregnant tuberculous women. It is rarely necessary to interrupt gestation for tuberculosis, and unless this is done during the first three months, it is far safer to permit the pregnancy to continue to term. Whenever a tuberculous patient is delivered or operated upon and an anesthetic is necessary, local anesthesia should be used.)

The value of the Aschheim-Zondek test in the detection of hydatidiform and chorionepithelioma is discussed by Nürnberger,⁵⁶ Reeb,⁵⁷ Ginglinger,⁵⁸ Wladika,⁵⁹ Gerritzen,⁶⁰ Hady⁶¹ and many others. (In nearly all cases of hydatidiform mole and chorionepithelioma, there is an unusually strong Aschheim-Zondek reaction. Thus if more than 50,000 mouse units are found, there are most likely pathologic changes in the placenta. If 200,000 or more mouse units are present, the diagnosis of hydatid mole or chorionepithelioma may be made with certainty. Occasionally there will be a negative Aschheim-Zondek test in the presence of an hydatid mole as in the case recently reported by Bleuler.⁶²)

Schmitz⁶³ advocates hysterectomy followed by radiation therapy for cases of chorionepithelioma and Wintz⁶⁴ reports at least 8 cures out of 11 cases of chorionepitheliomas treated by roentgen ray therapy. The latter author maintains that radium is not only superfluous but also dangerous because of the necessary manipulation. (In recent years excellent results have been reported in small series of cases of chorionepithelioma where irradiation therapy was used. Most likely the safest procedure is hysterectomy followed by x-ray treatment. Patients who have had hydatid moles should be closely followed for years and Aschheim-Zondek or Friedman tests should be performed at regular intervals. In women over forty years of age, if a hydatid mole is found, a hysterectomy should be performed because the danger of the subse-

quent development of a chorionepithelioma is far greater than in young women and the death rate is much higher.)

The Toxemias.—In the opinion of Falls,⁶⁵ Lugol's solution administered orally, intravenously or intramuscularly is of value both as a prophylactic and a curative remedy in hyperemesis gravidarum. He has not found it necessary to induce abortion for this complication since using Lugol's solution. Van Wyck⁶⁶ advocates the use of glucose solution, sedatives, attention to bowel elimination and isolation for patients who vomit excessively. The continuous administration of glucose or venoclysis is recommended by McConnell,⁶⁷ and Aburel⁶⁸ asserts he cures hyperemesis by anesthetizing the lumbo-aortic plexus. (The use of Lugol's solution as suggested by Falls will undoubtedly help many women with hyperemesis. The usual treatment consists of isolation, bedrest, subcutaneous and intravenous injections of glucose solution, sedatives, duodenal feeding in stubborn cases and a good deal of psychotherapy, especially at the start. If improvement does not follow in a short time, it is best to empty the uterus.)

Nephritis in pregnancy has been the subject of a number of papers. Kellogg⁶⁹ expresses his views based upon an experience of 1,100 cases. In a group of 225 patients seen in two pregnancies, 80 per cent showed a recurrence of albuminuria and hypertension in the second pregnancy. The general impression gained from a series of 68 patients seen in more than two gestations was that with each successive pregnancy, the toxemia becomes worse earlier in pregnancy. In Schroderus'⁷⁰ series of women who had renal complications during pregnancy and who subsequently conceived again, 87 per cent had a return of the kidney disturbance. Stieglitz⁷¹ analyzes a series of 60 cases of nephritis in pregnancy paying special attention to classification and treatment. Stander and Peckham⁷² point out the bad prognosis of this complication. In their series the maternal mortality occurring within ten years was 42.5 per cent whereas the average mortality for women between thirty and forty years of age in this country is 7.5 per cent. In the presence of definite chronic nephritis, the authors advocate termination of pregnancy and prevention of further pregnancies by either contraception or sterilization. Peckham and Stout⁷³ reexamined a large series of women four months to four years after they had had toxemia of pregnancy excluding eclampsia and vomiting. They found that 40 per cent had a definite chronic nephritis, and they suggest that the differential diagnosis between nephritic and nonnephritic toxemia should not be made until four months after delivery. Gibberd⁷⁴ emphasizes that a previously healthy patient suffering from albuminuria during pregnancy runs the risk of developing eclampsia, patent chronic nephritis, occult nephritis, the danger of losing her baby by death in utero or by death during the neonatal period from prematurity. (It is generally conceded that nephritis in pregnancy is a very serious complication. If the renal involvement manifests itself early in pregnancy, it is rarely possible to carry the patient along until she can give birth to a live baby. In most cases in spite of rest in bed, a strict diet and all known therapy, nothing will be gained by waiting, but a good deal of damage will result. Most of the babies perish in utero long before term, and of those which are born alive, most are puny and seldom survive. Furthermore, irreparable damage is done to the mother's kidneys with the result that her life will be considerably shortened. Hence, when a preg-

nant woman is found to have definite chronic nephritis, it is best to empty the uterus without delay unless the patient is a primipara. All the risks of waiting must be explained to the patient and her husband. Nonpregnant women with chronic nephritis should be explicitly told how to prevent conception or should be sterilized. When operating on pregnant patients who have nephritis, it is best to use local anesthesia. Women who apparently recover from nephritis, should not become pregnant for at least three years afterward and only after repeated examinations of kidney function can be considered normal. In spite of this there may be a recurrence of nephritis.)

Many articles have been written on urinary tract infections in pregnancy. McComb⁷⁵ reviews a series of cases of pyelitis, pyelonephritis and pyonephrosis occurring in pregnancy and outlines his treatment which includes ureteral catheterization. Rose and Rollins⁷⁶ wrote an elaborate paper on pyelonephritis in pregnancy and Morris and Langlois⁷⁷ describe the treatment they used in 58 cases of urinary tract infections observed during or after pregnancy. Crabtree and Prather⁷⁸ pointed out the activities of a urologist in a lying-in hospital. In their work at the Boston Lying-in Hospital, they have reversed the figures on pyelonephritis of pregnancy and postpartum pyelonephritis cases which require hospital care, they have been made cognizant of important respects in which pregnancy influences common urologic conditions in the nonpregnant, and they have had opened to them a field for conservative surgery of the kidney before renal damage has become very extensive. Crabtree⁷⁹ also discusses the changes in the urinary tract in women as the result of normal pregnancy and Prather⁸⁰ the effect of changes due to pregnancy on urinary tract disease. Dodds⁸¹ investigated the question of bacteriuria and found that 87.2 per cent of 793 antenatal, parturient, and puerperal specimens of urine were sterile. He found colon bacilli in 5.7 per cent of the specimens and could not detect any relationship between bacteriuria and parity, period of pregnancy, septic foci, toxemia, previous renal disease or morbid puerperium. Haselhorst⁸² followed up 62 patients who had pyelitis during pregnancy and found that 39 sooner or later had trouble. Thus 19 had a recurrence in a subsequent pregnancy, 3 had hypertension and 14 had edema. Grievs⁸³ reexamined 100 women some time after they had had pyelitis in pregnancy and found 26 who were not cured either clinically or bacteriologically, 14 who were not cured bacteriologically and 5 recurrences in 11 subsequent pregnancies. (Just as every maternity hospital has one or more internists on its staff so will every progressive lying-in hospital soon have a urologist associated with it. Urinary tract infections during pregnancy and the puerperium are very common and few obstetricians possess the necessary knowledge and skill to properly perform ureteral catheterizations and, where necessary, surgery on the kidneys. Furthermore all patients who have urinary tract infections during pregnancy or the early puerperium must be followed up and oftentimes treated for months and years afterwards and this is really the province of the urologist. Only by the cooperation of obstetrician and urologist can the best results be obtained in these cases. To neglect the follow-up of a patient who has had pyelitis in pregnancy is serious negligence, because even though a woman may apparently recover from pyelitis completely, subsequent examination in many such cases will reveal a persistence or a recurrence of the trouble. During the puerperium, a diagnosis of pyelitis is frequently made either because the

real cause of fever cannot be found or because the physician desires to cover up puerperal infection. At least one catheterized specimen of urine should be examined before a diagnosis of pyelitis is made.)

Guthmann and Ehrhardt⁸⁴ and also Gremme⁸⁵ studied ureteral dilatation during pregnancy after the intravenous administration of dyes. These authors agree that dilatation of the ureters may be found in the second half of gestation in nearly all women and is a physiologic occurrence. (This is an almost universal opinion at the present time. In most cases there are no abnormal symptoms referable to the dilatation. The latter is due to hypotonicity of the ureters. Likewise from the fifth month onward, the lower part of the abdominal ureter is pushed aside by the growing uterus and this may be found in at least 80 per cent of women after the seventh month. In many cases ureteral kinks are present. There does not seem to be any relationship between dilatation of the ureters and pyelitis.)

Eclampsia properly continues to hold the attention of obstetricians. Harding and Van Wyck⁸⁶ reemphasize their belief that the commonly occurring dietetic factor which enters into the production of eclampsia and preeclampsia is sodium chloride. Therefore restriction of salt is important during pregnancy and especially when patients have toxemia. On the other hand these authors believe that proteins and fats are innocuous to patients with preeclampsia and eclampsia. McCord⁸⁷ outlines the conservative treatment of this disease for the general practitioner. Beck's⁸⁸ study of 97 cases proved to him that phlebotomy is a very valuable measure, that eclamptic patients have a remarkable tolerance for morphine and that conservative gives far better results for the mothers than radical therapy. Schumann⁸⁹ reports 111 cases of toxemia with a death rate of 5.4 per cent. Of the 28 women with eclampsia 21.5 per cent died. The treatment was essentially conservative. Gordon⁹⁰ is likewise in favor of conservatism although he prefers emptying the uterus especially by cesarean section for patients with preeclampsia. Müller⁹¹ is of the opinion that under similar conditions the purely active treatment yields the same results as the modified active therapy. Diekmann⁹² suggests the use of 500 to 1000 c.c. of a 6 per cent gum acacia solution in the treatment of eclampsia because there is a marked concentration of the blood. The results with this therapy have been strikingly good. Goeke⁹³ advocates the use of pernoeton, but in spite of this he favors emptying the uterus as early as possible, especially by cesarean section. Sehey⁹⁴ administers thymophysin to hasten labor in eclamptic patients and he combines this with the Stroganoff treatment. (The generally accepted treatment at the present time for the vast majority of eclamptic patients is ultraconservatism with dependence upon morphine, sedatives, glucose and perhaps laxatives. Gum acacia is certainly worthy of trial. Colonic irrigations, gastric lavage and hot packs are not only unnecessary but they may result in harm. The pregnant uterus should be left alone, unless spontaneous labor sets in during an attack, as it frequently does. In this case, labor should be shortened by eliminating the second stage if it can be done without harm. If an anesthetic is necessary local anesthesia should be used whenever possible. More important than the treatment of eclampsia is its prevention. Authorities agree that nearly all cases of eclampsia may be eliminated by proper prenatal care. While great progress has been made along these lines, about 5,000 women still lose their lives in this country needlessly each year from eclampsia. Fur-

thermore, of the 20,000 or more women who develop eclampsia each year and recover, a large proportion have some sequelae as the result of their attack.)

(To be Continued in June Issue.)

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Correspondence

PITUITRIN IN GYNECOLOGY

To the Editor: During the last twenty years the action of pituitrin in obstetric practice has been so carefully studied that its uses and dangers are well known. Pituitrin contracts smooth muscle fibers and this is especially manifest on the pregnant uterus, because of the enormous hypertrophy of the muscle fibers. It raises the blood pressure because it contracts the smooth muscle fibers of the blood vessels, and it lowers the pulse because of a like result on the coronary vessels. In consequence of this effect on the hypertrophied smooth muscle fibers of the breast, Ott and Scott, and Schäfer and Mackenzie noting the increased rapidity of flow of milk from the breast, erroneously thought that pituitrin was a galactagogue. It also for the same reason stimulates intestinal peristalsis and is therefore a valuable aid in overcoming postoperative distention of the intestines.

Though the hemostatic action of pituitrin is most outspoken in the pregnant uterus, it may be used with remarkable results in controlling the bleeding in gynecologic operative work. I have used it this way in all types of gynecologic operations now for several years in many hundreds of cases.

The danger of inadvertently perforating the uterus during curettage is well known. A hypodermic injection of 1 c.c. of surgical pituitrin into the paracervical tissues just before starting the dilatation of the cervix causes the uterus to contract and reduces this danger to a minimum. Plastic operations on the vagina are frequently so bloody and the field so obscured that none but the operator himself is cognizant of the steps in the operative technic. Pituitrin will so reduce this useless and frequently dangerous loss of blood that the steps of a difficult vaginal technic will be as readily understandable to a bystander as the processes of an abdominal operation. Used preliminary to a vaginal hysterectomy it may allow this operation to be performed even by morecellation with little danger in the anemic individual when some less indicated procedure might otherwise be felt advisable. A large fibroid of the uterus with enormously dilated vessels may contain several ounces of blood of great value to the patient if the blood could be removed from the tumor. An injection of pituitrin directly into the tumor will cause the tumor to contract and whiten and will drive out much of this valuable blood from the tumor into patient's circulation. Extensive operations which otherwise might be dangerously bloody are performed frequently with as little blood loss as one or two ounces.

Moving pictures of operations are frequently seriously obscured by the constant flow of blood. Dr. Harold Jones of St. Luke's Hospital, Chicago, recently exhibited several films made of operations under the effect of pituitrin and bleeding was so much under control that one might think that the operations were being performed upon cadavers.

One or 2 c.c. of surgical pituitrin is given into the uterine body during abdominal operations or into the paracervical tissues during vaginal work. If given into an accessible area it may be administered at the exact time desired. The effect is not a local one. Within two minutes, usually, the tissues will become blanched and the hemostasis is in action and persists for an average of twenty minutes. If necessary the medication may be repeated. At the height of the activity the anesthetist may notice blanching of the patient's face. The conscious patient at

this time may feel "queer." Blood pressure readings were taken during the course of all operations and a study of several hundred readings reveals only an occasional elevation of blood pressure to a maximum of twenty points and those only among such as had normal or low blood pressures previous to operation. At first the medication was omitted in those with elevated blood pressures. It was found, however, that the administration of the anesthetic produces a lowering of the blood pressure in such cases so latterly pituitrin has been used when hemostasis seemed desirable even when the blood pressure was quite high, and its use has never increased the pressures to a level higher than it was before the anesthetic was started.

It, of course, is imperative that strategic ligations be made as carefully when pituitrin is used as when operating without a hemostatic. If this is done I am certain that the idea that pituitrin leads to late secondary bleeding will be found in error and the supposed secondary bleeding is nothing but the escape of blood which accumulated after the pituitrin had ceased to act.

I would suggest the employment of pituitrin as a valuable agent in controlling the waste of blood during (gynecologic) operations, for I have found that it is followed by no untoward effect in a very extensive use over a period of several years.

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Dr. Charles L. Bonifield

Dr. Charles L. Bonifield, a member of the Advisory Editorial Board of this Journal, died in Cincinnati, on April 23, in the sixty-ninth year of his age. A more extended obituary will be published in the June issue.

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POLYNEURITIS GRAVIDARUM A "PRESUMABLE" TOXEMIA OF PREGNANCY

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WE RECOGNIZE a number of serious conditions which may complicate pregnancy, designated as the toxemias, including eclampsia and preeclamptic toxemia, nephritic toxemia, pernicious vomiting, and the like. While we still have to admit a profound ignorance in regard to the exact etiology of these conditions, they are universally regarded as being of a toxic origin, and all may present marked disturbances of general metabolism.

In addition to this more or less well defined group, there is still another group of cases which are much less frequently seen and even less well understood, which are usually classed as presumable toxemias. Under this category we may include certain psychoses, excessive salivation, the noncontagious skin lesion impetigo gestationis, a rare but highly fatal malady, and certain examples of multiple neuritis. This latter is a condition which is quite distinct from the more frequently seen traumatic and infectious types, and illustrating which we desire to present some of the findings noted in three patients whom we had the opportunity of observing recently.

Not infrequently women are seen who in the latter weeks of pregnancy complain of numbness and tingling in the hands and arms, with possibly more or less severe radiating pains in the shoulders and arms or possibly the lower extremities. These symptoms may give rise to considerable discomfort, but the general health is ordinarily not affected except possibly from loss of sleep. These patients may be regarded as suffering from a mild form of peripheral neuritis, of possibly toxic origin. Considerable relief may be given the patient by the application

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of heat and the employment of massage, while mild sedatives may occasionally be necessary to promote sleep. The symptoms ordinarily subside entirely in the puerperium.

At times a more severe type is observed in which the injury to one or more nerves is so extensive as to cause an actual paralysis of the muscles which they supply. This may occur during the course of pregnancy or may even originate during the puerperium. In this type, there is usually numbness and tingling in the affected parts, followed by pain, and this in turn succeeded by weakness and paralysis. There may be no disturbance of general health. The prognosis so far as life is concerned is usually good in this group, although the vagus and phrenic nerves might become involved in degenerative processes. After a rather prolonged convalescence, the paralysis may clear up entirely, though in some instances there may be a permanent residual disability, and atrophy of the affected muscles. One or more of the cranial nerves may be affected.

In a third group of patients a much more serious state of affairs is encountered. The patients appear profoundly ill. There is persistent vomiting with rapid and progressive loss of weight. There may be quite profound mental disturbances and progressive involvement of various nerves with paralysis of the corresponding muscles. The mortality in this group is high and is generally about 25 per cent.

Whether these three groups simply represent degrees of the same toxic process, or separate and distinct conditions it is impossible to say, as the toxic agent is unknown. Especially in the last group, there would seem to be little doubt as to the toxic nature of the condition, though in any given patient presenting the signs and symptoms of neuritis during pregnancy or the puerperium, it is necessary to exclude other possible causes of neuritis such as lead, alcohol, infections, etc., before regarding it as a toxemia of pregnancy.

While the condition has been recognized as a complication of pregnancy and the puerperium for a long time, it occurs very infrequently in the severe form and no one person has had the opportunity of observing a large series of cases.

Among the earliest references to the condition is a paper by Churchill, published in 1854, in which he reports a case of paralysis following delivery observed by himself, and collected 33 other examples of various types. Only a few of these apparently fall into the group caused by peripheral lesions of the nerves, many of the others being of the hemiplegic type. Churchill suspected the possibly toxic nature of the conditions on account of the association of albuminuria at times.

Möbius in 1887, reported seven cases of peripheral neuritis, all occurring in the puerperium, and with no associated general disturbances. None of these were due to trauma, and all recovered. He subsequently reported several other cases of a similar nature. Apparently, the earliest recorded case associated with severe vomiting and a profound general disturbance is that of Whitfield reported in 1889. He ascribed the neuritis, and the resulting paralysis to the persistent vomiting. This was undoubtedly one of the severe toxic type. The patient recovered. In the same

year Denos, Pinard, and Joffroy (quoted by Möbius) described a similar one. Lindemann, in a fatal case reported by Solowieff, found at autopsy in addition to lesions of various peripheral nerves, a fatty degeneration of the liver with cloudy swelling, and degenerative changes in the kidneys. Similar lesions were found in the liver and kidneys of the fetus. He did not regard these lesions as specific. During the illness of this patient, Solowieff recorded the interesting observation that the stomach contents contained no hydrochloric acid, this being ascribed at the time to the fact that she had been taking "soda water." This patient also presented marked mental disturbances during her illness.

Von Hösslin, in 1905, wrote an excellent review of the subject and collected 94 cases from the literature, including several observed by himself. The reader is referred to his article for a complete bibliography up to that time. His series included all types, in some only a single nerve being involved, in others groups of nerves, while still others were of the severe type with progressive general paralysis, and associated severe vomiting and mental disturbances. In those patients presenting a generalized paralysis, he found the mortality to be 20 per cent.

Von Hösslin did not feel that interruption of the pregnancy was necessarily indicated in this condition, even in the severe form. He based this statement on the fact that many patients improved without having the pregnancy interrupted, and also on the fact that termination of the pregnancy was not necessarily followed by improvement. Furthermore, in not a few patients, the first symptoms appear in the puerperium, several days or even more after the pregnancy has come to an end. In the presence of a vital indication, or developing blindness, however, he conceded that pregnancy should be interrupted.

Other observers, such as Schauta, Windscheid, and Johannsen felt that pregnancy should be interrupted in those instances where improvement failed to occur following palliative treatment.

Among the most recent series reported is that of Albeck, who presented 9 cases of the severe type with severe vomiting, psychoses, and progressive paralysis. In 7 of them pregnancy was interrupted, all apparently recovered, though the convalescence was prolonged, and months elapsed before normal muscular function was restored.

Seitz regards the disease as of toxic origin (other possible causes having been excluded). He believes that only in the severe cases is interruption of the pregnancy called for, and especially if the optic or phrenic nerves show signs of involvement. He also states that interruption of the pregnancy does not necessarily insure a good result, this conclusion being drawn from the fact that so many cases develop in the early puerperium. He cites a case of A. Meyer treated successfully during pregnancy by the injection of 10 c.c. of serum from a healthy pregnant woman.

Several instances of this condition associated with death of the ovum in utero are recorded. Madge, in 1871, recorded a case in which death of the ovum occurred at four months with retention of it for seven months longer before it was expelled spontaneously. This patient developed extensive paralysis of the peripheral type, but recovered completely before expulsion of the ovum.

Korsakow reported a case of paralysis resulting from peripheral neuritis, in which the child died several days before delivery. Death of the child did not bring about immediate improvement, the convalescence being long drawn out, and some permanent paralysis persisting. Korsakow and Serbski observed an example of the condition associated with advanced extrauterine pregnancy and dead fetus.

In none of the examples of this presumable toxemia reported up to the present time, has there been any attempt to study the changes which occur in the general metabolism of the patients affected. In the three

patients we recently observed, we had the opportunity to obtain a number of observations along this line which proved to be of considerable interest. The course of events in these patients may be briefly presented as follows:

CASE 1.—(Unit No. 18232) A nineteen-year-old primipara, admitted in September, 1928, when she was approximately four months pregnant, complaining of persistent vomiting for the past week. Examination revealed an obese white woman, weight 82 kilos, pulse 130, temperature 37° C., blood pressure 115/80, four months pregnant. The blood picture was normal, urinalysis negative, and general physical examination revealed no gross abnormalities. Wassermann negative. Routine chemical examination of the blood showed no unusual findings other than a CO₂ combining power of 71 per cent, the very upper limit of normal, a finding to which proper significance was not attached at the time. Mentally, her memory was defective, and at times she acted in a rather erratic manner. She did not create the impression of being seriously ill, and was placed on the usual treatment for persistent vomiting, being given infusions of glucose as well as normal saline. She responded well to this and was discharged after eight days. Readmitted October 28, 1928, in obviously serious condition. There had been no vomiting in the interval, but she had become progressively weaker, losing the use of her legs almost entirely and to a less extent the use of her hands. Mental changes had become more pronounced, so that at times she was almost completely disoriented and also had auditory hallucinations. Examination showed no loss of weight. Definite though not deep jaundice present. Blood pressure 120/88, temperature 37° C., pulse 110. Urine showed a trace of albumin with numerous casts and white blood cells. Fundus palpable at level of umbilicus. Liver edge palpable 3 cm. below costal margin. A slight degree of secondary anemia was now present, hemoglobin (Sahli) 82 per cent, R.B.C. 3,550,000, W.B.C. 9,200. No edema present. The neurologic findings were of interest. She appeared dull and apathetic and was disoriented as to time, but particularly as to place and person, with definite memory impairment for recent events. Admits auditory hallucinations but no visual ones. Cranial nerves negative except for slight nystagmoid movements. There were no localized atrophies or deformities. Upper extremities showed weakness but no actual paralysis. The biceps and triceps reflexes were absent, also the umbilical reflex. The lower extremities also showed definite weakness though no actual paralysis. The knee and Achilles reflexes were absent, and the sense of motion of the toes was lost. Marked tenderness was present along the nerve trunks of the lower extremities. She complained of numbness of hands and forearms, but there were no objective sensory changes.

Diagnosis: Toxic polyneuritis and psychosis.

She was placed on a low protein diet with forced fluids, taking these very well for the first two days, the intake being 3,000 c.c. and 2,100 c.c. respectively. The output of urine was apparently rather scanty though it could not be accurately measured on account of incontinence from time to time. The only medication made use of was barbital and paraldehyde occasionally to promote sleep and to quiet her occasional periods of mental excitement. She vomited twice, but vomiting was not a feature of the clinical picture. During the first two days in the hospital, her general condition showed little change, but in the following two days her condition became much worse. The fluid intake decreased so that the intravenous administration of glucose was resorted to, the jaundice became somewhat more pronounced, and mentally she became very torpid. Evidence of progressive paralysis of the extremities appeared. She presented the appearance of an extremely ill woman, and it was felt that her best chance of recovery lay in terminating the pregnancy. This was done on November 1 by vaginal hysterotomy under nitrous oxide

and oxygen anesthesia, the fetus weighing 310 gm. and measuring 26.5 cm. in length.

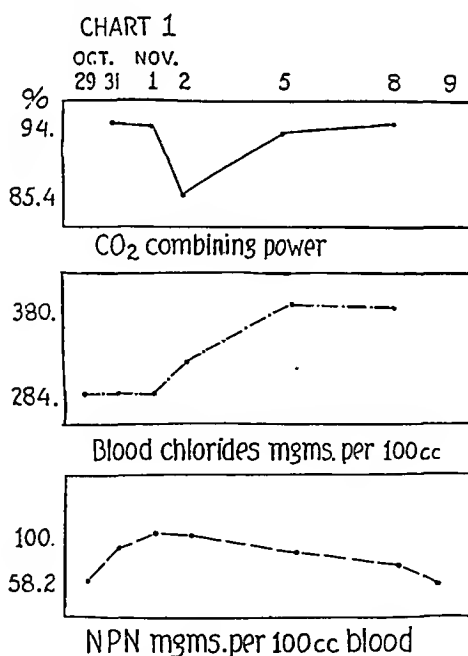
For the first few days postoperative, she showed some improvement. The urinary output increased, though it was still impossible to determine this accurately on account of periodic incontinence. The jaundice was rather less marked and she took fluids well by mouth with no vomiting. The mental state improved somewhat though the paralysis became more marked with almost complete flaccid paralysis of both lower extremities, bilateral wrist and foot drop, and complete absence of reflexes. The urine continued to show a trace of albumin with numerous hyaline and granular casts, white blood cells, and colon bacilli present.

The chemical studies made on the blood both before and after operation presented a number of findings of very considerable interest, showing a high nonprotein nitrogen and uric acid content, and low chlorides with a very high CO_2 combining power.

		N.P.N.	UR. AC.	CL.	SUGAR	CO_2
*Before operation	Oct. 29	58.2 mg. per 100 c.c.	—	—	94.3	—
	Oct. 31	87	11.5	284	105	94 %
	Nov. 1	100	12.3	284	100	93.8
After operation	Nov. 2	98	12.5	320	110	85.4
	Nov. 5	75	9.2	380	133	92.2
	Nov. 8	57.2	6.6	380	111	93

*In these determinations, the CO_2 combining power was estimated on the plasma, the other observations were on oxalated whole blood.

A single observation on the urine (reaction acid) prior to operation showed an ammonia coefficient of 5.7 per cent.



On account of the profound disturbance of metabolism which was obviously present, a number of other investigations were carried out which resulted in several findings of considerable interest. In view of the high CO_2 combining power, indicating changes in the nature of an alkalosis, the P_{H} of the blood was determined. This determination was made by McQuarrie, by his method, and the reading on November 3 was 7.42. This is regarded as the very upper limit of normal, and it is possible that had a specimen been taken twenty-four hours earlier it might have shown a marked degree of alkalinity. Repeated on November 9, the reading was 7.37.

On November 3, the same day as the first P_{11} determination was made, the fatty acids of the blood were determined by Dr. W. R. Bloor with the following result:

Cholesterol	61 mg. per 100 c.c. plasma (approximately half normal)
Total fatty acids	700 mg. per 100 c.c. plasma (nearly twice normal)
Phospholipids	218 mg. per 100 c.c. plasma (normal)

The spinal fluid on November 9 showed:

N.P.N.	35.3 mg. per 100 c.c.
Chlorides	660 mg. per 100 c.c.
Sugar	71.4 mg. per 100 c.c.
P_{11}	7.37

The Vaudenbergh reaction on blood showed:

Nov. 1	4.5 units bilirubin
Nov. 2	2 units bilirubin
Nov. 8	less than 1 bilirubin
Nov. 5	blood calcium, 9 mg. per 100 c.c.
	blood phosphates 4 mg. per 100 c.c.

These latter are both normal figures and the observations were not repeated.

After the slight improvement noted during the first two or three days postoperative, the patient's condition grew steadily worse. She became progressively weaker, paralysis became more pronounced, until it was finally almost complete, while her mental state was unimproved.

After the fourth day postoperative she showed a slight daily rise of temperature to 38° or 38.5° C. The urine (always acid in reaction) showed constantly numerous white blood cells and colon bacilli, these being present from the time of her second admission. There was undoubtedly some infection of the urinary tract present, though it did not form a prominent feature of the clinical picture.

The patient died on the eleventh day postoperative, apparently as a result of respiratory failure; possibly involvement of the phrenic nerves may have played a part. Unfortunately no autopsy could be obtained.

CASE 2.—(Unit No. 22465) A twenty-year-old woman in her first pregnancy, admitted March 6, 1929, complaining of weakness, loss of weight, and deafness. The date of the last menstrual period was unreliable being given as September 16 and December 15 preceding admission. From subsequent findings the former is probably the correct date. The pregnancy was uneventful except for a slight respiratory infection of a few days duration in October. About the middle of December she began to vomit occasionally, the vomiting becoming persistent, and in six weeks she lost about 35 pounds in weight. For the two weeks prior to her admission vomiting was not a prominent symptom however. During the past two weeks her hearing had become quite defective. It was noticed that she tended to make irrelevant remarks and at times was quite drowsy. One week before admission she began to notice weakness of the legs and impairment of locomotion.

Examination revealed a poorly nourished woman, weight 32.2 kilos; temperature 37° C.; pulse 78; respirations 20; blood pressure 90/60. Some degree of secondary anemia, hemoglobin 75 per cent; R.B.C. 4,020,000; W.B.C. 7,950. No jaundice. Wassermann negative. Urine showed both acetone and diacetic acid but no other abnormal findings. Pelvic examination showed the uterus to be a size slightly larger than a three months' pregnancy. (This was too small for the period of amenorrhea if the last menstrual period occurred in September, but at this time the exact date was not known.)

Lumbar puncture failed to obtain any fluid though the canal was definitely entered. Neurologic examination revealed a mild mental confusion and defective memory with disorientation as to time, but not as to place and person. Examination of the cranial nerves showed advanced nerve deafness, both auditory nerves being involved, and also well marked nystagmus. The upper extremities showed no neurologic abnormalities, but there was marked weakness of the lower extremities, with absent knee jerks and diminished Achilles reflexes. She was unable to walk without assistance and the gait showed weakness and ataxia.

Diagnosis: Toxic polyneuritis and psychosis.

She was placed on a high carbohydrate diet with forced fluids on which she did very well for the first twenty-four hours, although there was occasional vomiting. She was also given glucose and normal saline intravenously. It was impossible to estimate the urinary output on account of incontinence.

During the next two days her condition became much worse with more pronounced mental disturbance and progressive paralysis. Vomiting was not a feature, but on account of inability to cooperate, fluid administration became entirely dependent upon intravenous glucose and saline.

On account of her rather rapid course, the pregnancy was terminated on March 9, three days after admission, by dilatation of the cervix followed by removal of the ovum, nitrous oxide and oxygen anesthesia being used. When the uterus was emptied, a dead ovum representing an approximately three and one-half months' pregnancy was obtained. The embryo was mummified, and the placenta markedly infarcted though microscopic examination of the latter revealed syncytial cells that were apparently still active. From the findings and menstrual history, it would appear that the symptoms began shortly before the death of the ovum, though it is impossible to be specific in regard to this. We assume that the pregnancy began in September, and that death of the ovum occurred three months or so later, the dead ovum being retained until it was removed at operation.

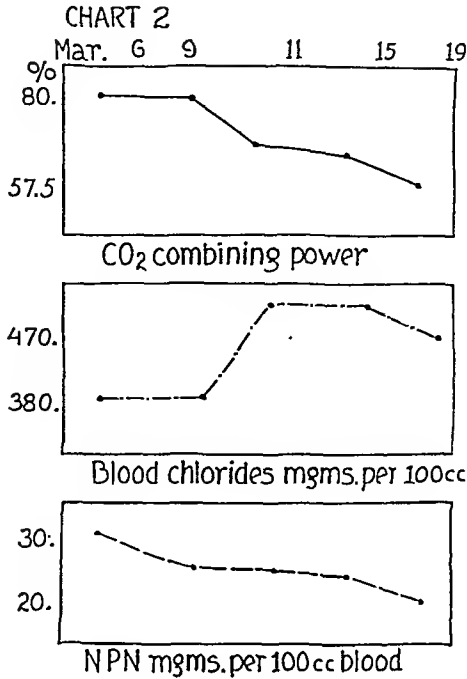
For several days following operation there was definite improvement. She took fluids fairly well by mouth and in addition was given glucose and normal saline intravenously. The urinary output improved materially though accurate measurements were still impossible on account of incontinence; acetone and diacetic acid disappeared from the urine. The hearing returned to practically normal. The paralysis persisted however, and after the first few days post-operative, became progressive involving both upper and lower extremities.

In spite of the fact that she lost only a small amount of blood at operation, she developed a marked degree of secondary anemia and on the ninth day post-operative, the hemoglobin was 45 per cent and the R.B.C. 2,600,000. She was therefore given transfusions of 500 c.c. of citrated blood on two occasions.

Such improvement as was noted immediately postoperative proved to be of a very temporary nature. She became much worse on the eleventh day postoperative, with extreme prostration, almost complete paralysis, and died on March 21, 1929, the thirteenth day after termination of the pregnancy. She never developed any jaundice. Autopsy obtained.

The following results were obtained from the chemical examination of the blood at various times: Vandenbergh—2.0 units bilirubin.

			N.P.N.	UR. AC. CL.	SUGAR	CO ₂	CA.	PHOSPH.
Before operation	March 6	30 mg. per 100 c.c.	5	380	80	80%	11.6	3.4
	March 9	24 mg. per 100 c.c.	—	380	80	80%	10	3.3
After operation	March 11	23 mg. per 100 c.c.	—	500	100	66%	—	—
	March 15	24 mg. per 100 c.c.	—	500	80	61%	—	—
	March 19	20 mg. per 100 c.c.	—	470	85	57.5%	—	—



Urine obtained the day before operation showed an ammonia coefficient of 8.75 per cent (reaction acid). No other determinations of this were made on account of unsatisfactory collections.

The spinal fluid obtained at the time of operation showed the chloride content to be 575 mg. per 100 c.c. The P_{H} of the spinal fluid was 7.30 (upper limit of normal), the blood obtained the same day showed a CO₂ combining power of 80 per cent. The CO₂ content of the spinal fluid was 62.1 mg. per 100 c.c.

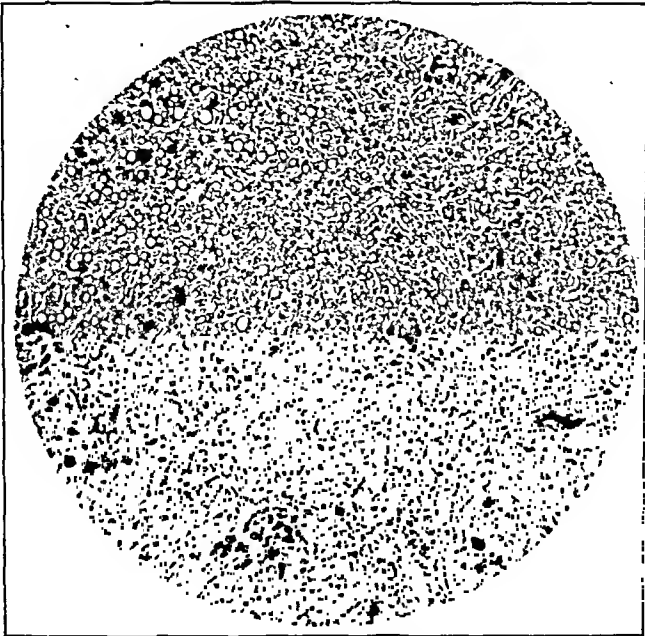


Fig. 1.—Microphotograph of liver from Case 2 showing extensive fatty infiltration Not a characteristic lesion.

Autopsy Findings.—Liver: Weight 1,250 gm. No gross or microscopic areas of necrosis. Definite fatty infiltration is present. (This cannot be regarded as specific.) See Fig. 1.

Kidneys: Normal except for one microscopic area of polymorph infiltration in the parenchyma.

Lungs: A few early patches of bronchopneumonia.



Fig. 2.—Microphotograph of cross section of radial nerve stained by the Marchi method showing areas of degeneration.



Fig. 3.—Microphotograph of longitudinal section of sciatic nerve stained by the Marchi method showing areas of degeneration.

Brain and Spinal Cord: Sections stained with Nissl's and Weigert's iron hematoxylin stains showed no pathology.

Peripheral Nerves: Sections of the peripheral nerves, including the sciatic, ulnar, and radial, stained by the Marchi method showed well marked peripheral neuritis of the toxic type. See Figs. 2 and 3.

No other findings of significance were noted.

CASE 3.—(Unit No. 25599) A thirty-year-old woman, admitted June 20, 1929, on account of a confused mental state which had developed four or five days previously. Three weeks previously a pregnancy of three months' duration had been terminated at another hospital on account of persistent vomiting. So far as is known, the operation was not followed by any infection, and vomiting ceased after interruption of the pregnancy. Up to the time of the termination of the pregnancy there had been no mental disturbance and no paralysis, but there had been hyperesthesia of the hands and feet. A wrist drop developed three days after operation.

Examination: Temperature 37.5; respirations 22; pulse 128; blood pressure 120/110. Sclerae jaundiced; Wassermann negative; urine negative. She showed evidence of some loss of weight. No other points of interest were noted except the neurologic findings which were as follows: The patient was highly emotional, and partially disoriented with impairment of memory for recent events. Cranial nerves negative except for some nystagmus. Weakness of both upper extremities with bilateral wrist drop, the biceps reflexes being diminished and the triceps and radial reflexes absent. The nerve trunks of the upper extremities were very sensitive to deep pressure and the dorsal interossei muscles of the hands showed definite atrophy. The lower extremities showed marked weakness and limitation of movement with bilateral foot-drop, the nerve trunks being markedly sensitive to pressure. Knee and Achilles reflexes absent. Marked hyperesthesia and hyperalgesia in both upper and lower extremities.

Diagnosis: Toxic polyneuritis and psychosis.

Physiotherapy treatments resulted in some improvement of muscular movements. The mental symptoms varied considerably, and at times she was completely disoriented and presented visual hallucinations and delusions, but five weeks after admission her mental state was practically normal.

On June 25th the following findings were noted on chemical study of the blood.

Sugar	101.5 mg. per 100 c.c.
Calcium	11.8 mg. per 100 c.c.
Chlorides	464 mg. per 100 c.c.
N.P.N.	35.9 mg. per 100 c.c.
CO ₂	58.1%

The spinal fluid showed a P_H of 7.32. There was not a profound disturbance of metabolism present such as was noted in the other two patients.

She was discharged from the hospital on September 1, 1929, against advice, her mental condition normal, residual paralysis of both lower and upper extremities still present, though the lower extremities showed quite marked improvement. Banjo splints were applied to the hands, and arrangements were made to continue physiotherapy with baking and massage at her home.

When seen on September 25, 1929, the condition of the extremities was not as good, marked atrophy now being present. She was not seen again by us, and died on November 29, 1929. It was learned that after she left the hospital she had rather persistent vomiting for three or four weeks, but this ceased entirely about four weeks before her death. No further mental disturbance developed, and she was able to take a few steps shortly before she died. She was jaundiced for a few days before death, and it was said that profound weakness, drowsiness, and stupor without edema or convulsions preceded her death.

SUMMARY AND DISCUSSION

Three cases are presented, the patients showing signs of extensive polyneuritis associated with pregnancy. There was also a profound mental disturbance in each instance, and at the onset of the illness severe and persistent vomiting. We feel that we have satisfactorily excluded such toxic agents as alcohol, and lead, and also infection as possible etiologic factors, and feel justified therefore in ascribing the origin to a toxemic process associated with pregnancy. It is impossible to make any definite statements in regard to the exact etiology, and for the present, the condition must remain in the category of unsolved problems in common with the other toxemias of pregnancy.

While this acute form is an unusual complication of pregnancy, it is an extremely serious one, and carries with it a high mortality.

In two of our patients, there was associated a profound disturbance of the general metabolism, characterized particularly by a high CO_2 combining power and low blood chlorides. The findings are those of an alkalosis, yet inasmuch as the P_H in each instance fell within normal limits, one must regard the condition present as a compensated alkalosis. In Case 3, no profound change in metabolism was noted, yet with a CO_2 combining power of 58.1 per cent and blood chlorides of 464 mg., there was at least a tendency in a similar direction, and quite possibly similar changes might have been found if we had had the opportunity to study her during the earlier stages of her illness.

It is interesting to speculate on the possible factors causing this type of disturbance. None of these women had had any alkaline medication during their illness. None showed any appreciable respiratory disturbance. All had had severe and persistent vomiting prior to admission. This vomiting, with the associated loss of hydrochloric acid may be a possible factor. Stander has observed a few instances of transient alkalosis in cases of pernicious vomiting which could apparently be attributed to this factor, but it was only a transient phenomenon. At the time the patients in Cases 1 and 2 were under observation in the hospital, it is true that occasional vomiting occurred, but it was not at all a prominent feature of the clinical picture, and had the alkalosis been caused by the severe vomiting which had occurred some weeks previously, and had this been the only factor, one would expect that complete adjustment would have taken place by the time of admission. Of course, in the presence of defective elimination, alkali might well be retained, and the CO_2 then would remain high. In Case 1 there evidently was retention, and the nonprotein nitrogen readings were consistently higher than normal, and yet with improved elimination before death and a marked drop in the nonprotein nitrogen the CO_2 combining power remained as high as ever.

In Case 2 with no evidence of retention the CO_2 combining power was high and did not approach a normal figure for more than a week after admission. Therefore while recognizing the possibility that the

vomiting may have been the important factor in the causation of the metabolic disturbances noted, yet we feel that there is sufficient evidence to suggest that it was not the sole factor and that other unknown conditions may have played a part in the production of these changes.

In Case 2 the association of the illness with a dead ovum (missed abortion) is also of interest. When the ovum was removed at operation, it had obviously perished some weeks previously, and yet as noted previously, microscopic examination did reveal some syncytial cells which were undoubtedly still living. Whether they played a part in the causation of the toxemia, or whether this had been inaugurated before the death of the ovum, continuing its acute course in spite of this fact, it is impossible to say, though the latter situation is the more probable. Under the circumstances present it is very questionable as to whether termination of the pregnancy did any good in this instance.

In regard to treatment, we have little to suggest. The exact etiology of the condition being unknown, treatment can obviously only be along general lines. In the presence of persistent vomiting, the administration of fluids, saline, and glucose by various methods would appear logical, as in the treatment of pernicious vomiting. With the possible presence of an alkalosis, alkalies should assuredly not be given.

As to whether the pregnancy should be terminated and if so when, we find it impossible to be specific.

In our Cases 1 and 2, there was some temporary improvement following the termination of the pregnancy, but this was only temporary. In our Case 3, the pregnancy had been terminated before the occurrence of mental symptoms, and in what probably represented the early stages of the peripheral nerve involvement, yet in spite of this the course was not arrested, though the vomiting ceased. Furthermore, a number of the recorded cases have shown the first symptoms in the puerperium, some days or longer after the pregnancy had come to an end.

With these observations in mind it is apparent that termination of the pregnancy will not necessarily result in the cure of the condition. Furthermore, as noted by Von Hösslin, many will recover without interruption of the pregnancy. On the other hand if the individual's natural resistance to the toxic process is not sufficient, or if she fails to respond to general measures, there would seem to be little else left to do, also as Seitz suggests in the event of involvement of the optic or phrenic nerves.

Treatment of the affected peripheral nerves, will be along the usual lines for such lesions arising from other causes and in the event of permanent disability, orthopedic appliances may become necessary.

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THE INFLUENCE OF AGE AND COLOR ON THE MATERNAL AND FETAL DEATH RATE

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IN A preceding communication, we have dealt with the age incidence in a large number of women delivered consecutively on the Obstetrical Service of the Johns Hopkins Hospital, and have discussed the influence of age on the type of delivery. Following this, it has seemed important to investigate the maternal and fetal death rate as influenced by the race of the mother, as well as by her age at the time of delivery.

For this purpose, we have used the same series of cases as in the former investigation, i. e. 15,370 consecutive deliveries, premature and full-term, during the period from January 1, 1907, to December 31, 1929. The material is almost equally divided between whites and blacks, primiparae and multiparae, as may be seen from Table I, from which twelve cases have been omitted because of lack of sufficient data.

TABLE I.

	WHITE	BLACK	TOTAL
Primiparae	4057	4347	8404
Multiparae	3738	3216	6954
Total	7795	7563	15,358

Tables II and III show the distribution of maternal deaths according to age, race, and parity in the entire series, together with the mortality percentage in each group. There were in all 121 deaths, a gross maternal mortality of 0.79 per cent. The death rate was higher among the black than the white women, being 0.94 and 0.64 per cent, respectively. It will be noted that the death rates are consistently higher in the black than in the white race when the cases are divided not only according to parity but also according to type of delivery. At first glance many of these racial differences seem small. Their significance has, however, been tested statistically by dividing each difference by its standard deviation, and from the quotient obtained, computing the probability of such an observed difference being the result of chance or of a sampling error. The results of these tests are shown in Table VIII.

It will be noted that the death rate in each type of delivery is higher in multiparae than in primiparae. As has been stated before, we con-

sider the primiparous population in this series of cases as fairly representative and normal. However, the multiparae contain a disproportionate number of referred emergency cases, and a decreased number of normal women, which to some extent accounts for the observed difference. Nevertheless, we believe that in a normal population similar conditions

TABLE II. MATERNAL DEATHS, ACCORDING TO RACE, AGE, AND PARITY*

	AGE - 16		17 - 19		20 - 24		25 - 29		30 - 34		35 - 39		40 -		TOTAL	
	TOTAL DELIV.	MAT. DEATHS	TOTAL DELIV.	MAT. DEATHS	TOTAL DELIV.	MAT. DEATHS	TOTAL DELIV.	MAT. DEATHS	TOTAL DELIV.	MAT. DEATHS	TOTAL DELIV.	MAT. DEATHS	TOTAL DELIV.	MAT. DEATHS	TOTAL DELIV.	MAT. DEATHS
White para 0	299	2	1347	2	1649	7	489	4	172	0	80	3	21	0	4057	18
Black para 0	806	6	1976	10	1180	10	269	4	75	1	37	0	4	0	4347	31
White para x	5	0	202	1	1007	3	1037	6	797	9	491	7	199	6	3738	32
Black para x	28	0	507	4	1244	11	737	6	373	9	242	8	85	2	3216	40
Total para 0	1105	8	3323	12	2829	17	758	8	247	1	117	3	25	0	8404	49
Total para x	33	0	709	5	2251	14	1774	12	1170	18	733	15	284	8	6954	72
Total white	304	2	1549	3	2656	10	1526	10	969	9	571	10	220	6	7795	50
Total black	834	6	2483	14	2424	21	1006	10	448	10	279	8	89	2	7563	71
Total pts.	1138	8	4032	17	5080	31	2532	20	1417	19	850	18	309	8	15,358	121

*Deliv., deliveries. Mat., maternal.

MATERNAL MORTALITY PERCENTAGE

	-16	17-19	20-24	25-29	30-34	35-39	40-	TOTAL
White para 0	0.67	0.15	0.42	0.82	—→	1.10	←—	0.44
Black para 0	0.74	0.51	0.85	1.49	—→	0.86	←—	0.71
White para x	—→0.48←—		0.30	0.58	1.13	1.43	3.02	0.86
Black para x	—→0.75←—		0.88	0.81	2.41	3.31	2.35	1.24
Total para 0	0.72	0.36	0.60	1.06	—→	1.03	←—	0.58
Total para x	—→0.67←—		0.62	0.68	1.54	2.05	2.82	1.04
Total white	0.66	0.19	0.38	0.66	0.93	1.75	2.73	0.64
Total black	0.72	0.56	0.87	0.99	2.23	2.87	2.25	0.94
Total pts.	0.70	0.42	0.61	0.79	1.34	2.12	2.59	0.79

*Deliv., deliveries. Mat., maternal.

would be observed, though to a lesser extent, owing to the increased number of obstetric complications to which the multipara is subject.

It will be observed that in both whites and blacks, primiparae and multiparae, the death rate is lowest in women delivered spontaneously at term, rises definitely with operative delivery, and is highest in premature births. Since in many cases the premature delivery is due to some grave obstetric complication, the latter finding is not surprising. Furthermore, the increased mortality of operative over spontaneous delivery is significant, and gives added force to the arguments of those advocating more conservative methods of obstetrics throughout the country, as well as more intelligent care of abnormal cases.

TABLE III. MATERNAL MORTALITY PERCENTAGES

	PER CENT
Total cases, both races	0.79
Total cases, white	0.64
Total cases, black	0.94
Total primiparae, both races	0.58
Total multiparae, both races	1.04
Total primiparae, white	0.44
Total primiparae, black	0.71
Total multiparae, white	0.86
Total multiparae, black	1.24
Total full-term spontaneous deliveries	0.21
Total full-term operative deliveries	2.12
Total premature deliveries	3.90
Full-term spontaneous, white	0.19
Full-term operative, white	1.86
Premature, white	2.96
Full-term spontaneous, black	0.24
Full-term operative, black	2.44
Premature, black	4.48
Full-term spontaneous, white primiparae	0.07
Full-term spontaneous, black primiparae	0.18
Full-term spontaneous, white multiparae	0.30
Full-term spontaneous, black multiparae	0.33
Full-term operative, white primiparae	1.28
Full-term operative, black primiparae	1.73
Full-term operative, white multiparae	2.81
Full-term operative, black multiparae	3.36
Premature, white primiparae	2.23
Premature, black primiparae	4.19
Premature, white multiparae	3.65
Premature, black multiparae	4.78

In each rubric of Tables II and III the mortality is higher among the blacks than the whites. Tested statistically some of these differences are highly significant, while others mean little. However, since all these differences, even though small, show the higher mortality to be on the side of the black race, one is safe in asserting that women of that race throughout their obstetric career are significantly poorer risks than are the white.

Table II indicates the mortality differences according to age. A study of this Table II indicates that the young woman of 16 years or less is not an ideal obstetric subject, and shows that the optimum age for child-bearing is between 17 and 19 years, inclusive. From then onward, there is a trend upward in the mortality rate, which rises rapidly as the older age groups are reached.

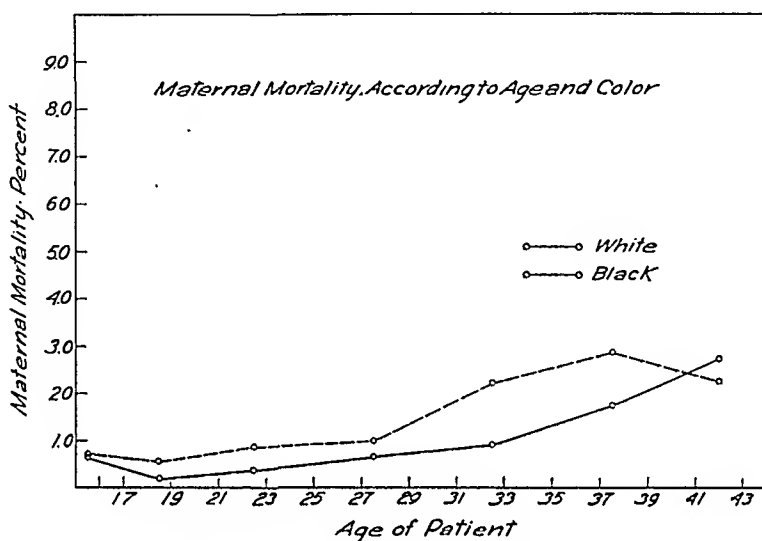


Fig. 1.—Indicating the higher maternal mortality among the black race. In both races the mortality increases with age.

Table IV sets forth the causes of death in the 121 women who succumbed in this series. Infection, toxemia, and hemorrhage, the three chief causes of death among obstetric patients, account for 64.46 per cent or about two-thirds of the total number. Infection, which in most statistics accounts for more deaths than any other cause, yields precedence to toxemia in our series. Moreover, it will be noted that only 6 of the 27 deaths due to infection occurred in white women. Consequently, the experience in this service indicates that the colored woman is not only more prone to become infected than the white, but is also less able to combat the infection once it has made its appearance.

Table IV A indicates the mortality rate among the patients in this series expressed in terms of 10,000 deliveries. In both races the maternal mortality from infection is higher in multiparous than in primiparous women. In white women toxemia accounts for approximately two-fifths of the mortality, while only one-eighth of the deaths are due to infection. Among the colored women, on the other hand, toxemia and infection account for almost one-fifth and one-third of the total deaths, respectively. Deaths due to hemorrhage are about equally divided in the two races. From our observation, it would seem that the higher mortality observed in the black race is due chiefly to a death rate from infection which is almost four times greater than in the white.

TABLE IV. CAUSES OF MATERNAL DEATHS

	WHITE			BLACK			TOTAL
	PARA 0	PARA X	TOTAL	PARA 0	PARA X	TOTAL	
<i>Group 1. Infection</i> <i>22.31 Per Cent of Total Deaths</i>							
1. Infection	2	4	6	9	12	21	27
<i>Group 2. Toxemia</i> <i>28.10 Per Cent of Total Deaths</i>							
1. Eclampsia	8	4	12	6	7	13	25
2. Nephritis	2	5	7	1	1	2	9
<i>Group 3. Hemorrhage</i> <i>14.05 Per Cent of Total Deaths</i>							
1. Placenta previa	0	5	5	0	2	2	7
2. Premature separation placenta	0	2	2	1	2	3	5
3. Postpartum hemorrhage	0	2	2	2	1	3	5
<i>Group 4. Other Obstetric Causes</i> <i>18.18 Per Cent of Total Deaths</i>							
1. Rupture of uterus	0	1	1	0	5	5	6
2. Embolus	1	2	3	1	1	2	5
3. Chloroform poisoning	1	0	1	1	1	2	3
4. Anesthesia	0	0	0	2	0	2	2
5. Cardiac	0	1	1	1	0	1	2
6. Extrauterine pregnancy	0	0	0	1	0	1	1
7. Other	2	0	2	1	0	1	3
<i>Group 5. Nonobstetric Causes</i> <i>17.36 Per Cent of Total Deaths</i>							
1. Lobar pneumonia	1	5	6	2	5	7	13
2. Tuberculosis	0	1	1	2	2	4	5
3. Other	1	0	1	1	1	2	3
Totals	18	32	50	31	40	71	121

TABLE IV A. DEATHS OF OBSTETRIC PATIENTS FOR 10,000 DELIVERIES, ACCORDING TO CAUSE OF DEATH

	WHITE			BLACK			TOTAL
	PARA 0	PARA X	TOTAL	PARA 0	PARA X	TOTAL	
Infection	4.9	10.7	7.7	20.7	37.3	27.8	17.6
Toxemia	24.6	24.1	24.4	16.1	24.9	19.8	22.1
Hemorrhage	0.0	24.1	11.5	6.9	15.5	10.6	11.1
Other Obstetric Causes	9.9	10.7	10.3	16.1	21.8	18.5	14.3
Nonobstetric causes	4.9	16.1	10.3	11.5	24.9	17.2	13.7
Total	44.3	85.7	64.2	71.3	124.4	93.9	78.8

Turning now to a consideration of fetal mortality, Table V indicates the stillborn and neonatal deaths observed in this series, according to race, age, and parity, together with the mortality percentage in each category. Again, a higher rate is found throughout in the black race, and one sufficiently higher to be in most cases extremely significant. As

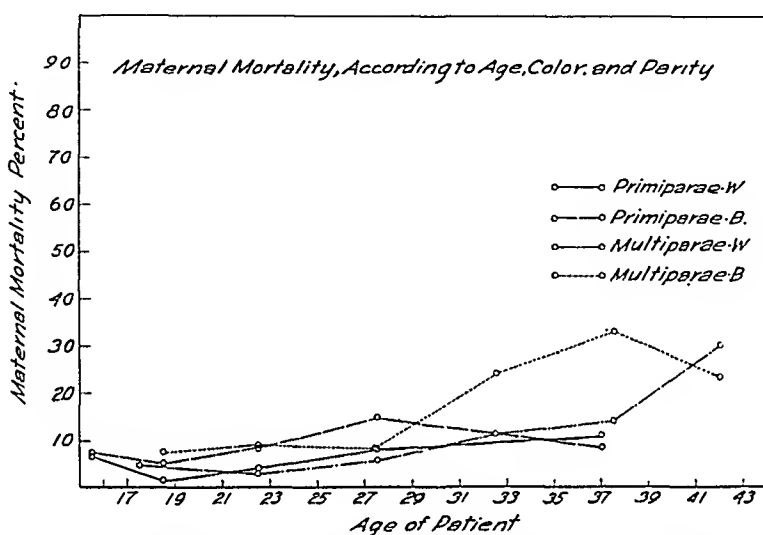


Fig. 2.—Indicating the higher mortality among multiparae. The "young primipara" has a higher mortality rate than does the woman of seventeen to twenty-five years.

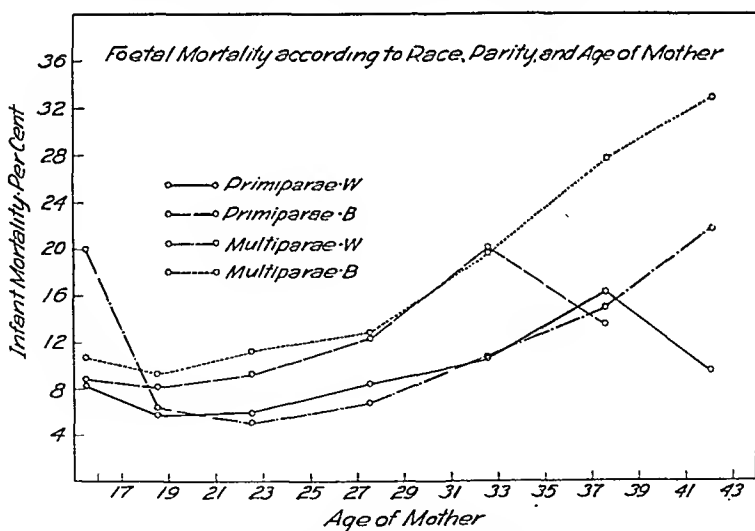


Fig. 3.—Indicating a relatively high fetal mortality below the age of seventeen, an optimum from seventeen to nineteen, and a steady rise from the age of twenty, becoming great as the older age groups are reached.

was observed in the discussion of maternal deaths, the fetal rate is higher among the multiparous than the primiparous women. The abnormal population in the former group probably accounts for a considerable part of this observed difference. A relatively high mortality is again noted among the young women; and this is particularly true in the case of the "young primipara." The black woman seems correspondingly

less affected by extreme youth than does the white. Again we find a rapidly rising mortality percentage in the later age groups, both in primiparae and multiparae. Here the abnormal population factor among the multiparae would seem to have little influence on the trend of the death rate, and we believe that this finding is significant.

TABLE V. TOTAL FETAL DEATHS, ACCORDING TO AGE, RACE AND PARITY

	AGE - 16		17 - 19		20 - 24		25 - 29		30 - 34		35 - 39		40 -		TOTAL	
	TOTAL DELIV.	FETAL DEATHS	TOTAL DELIV.	FETAL DEATHS	TOTAL DELIV.	FETAL DEATHS	TOTAL DELIV.	FETAL DEATHS	TOTAL DELIV.	FETAL DEATHS	TOTAL DELIV.	FETAL DEATHS	TOTAL DELIV.	FETAL DEATHS	TOTAL DELIV.	FETAL DEATHS
White para 0	299	24	1347	78	1649	98	489	41	172	18	80	13	21	2	4057	274
Black para 0	806	72	1976	163	1180	109	269	33	75	15	37	5	4	0	4347	397
White para x	5	1	202	13	1007	51	1037	71	797	85	491	73	199	43	3738	337
Black para x	28	3	507	47	1244	139	737	94	373	73	242	67	85	28	3216	451
Total para 0	1105	96	3323	241	2829	207	758	74	247	33	117	18	25	2	8404	671
Total para x	33	4	709	60	2251	190	1774	165	1170	158	733	140	284	71	6954	790
Total white	304	25	1549	91	2656	149	1526	112	969	103	571	86	220	45	7795	613
Total black	834	75	2483	210	2424	248	1006	127	448	88	279	72	89	28	7563	848
Total nts.	1138	100	4032	301	5080	397	2532	239	1417	191	850	158	309	73	15,358	1461

FETAL MORTALITY PERCENTAGE

AGE	-16	17-19	20-24	25-29	30-34	35-39	40-	TOTAL
White para 0	8.03	5.79	5.94	8.38	10.47	→14.85←		6.75
Black para 0	8.93	8.25	9.24	12.27	20.00	→12.20←		9.13
White para x	→6.76←		5.06	6.85	10.92	14.87	21.61	9.07
Black para x	→9.35←		11.17	12.75	19.57	27.69	32.94	14.02
Total para 0	8.69	7.25	7.32	9.76	13.36	→14.08←		7.98
Total para x	→8.63←		8.44	9.30	13.50	19.10	25.00	11.36
Total white	8.22	5.87	5.61	7.34	10.63	15.06	20.45	7.86
Total black	8.99	8.46	10.23	12.62	19.64	25.81	31.46	11.21
Total pts.	8.79	7.47	7.81	9.44	13.48	18.59	23.62	9.51

TABLE VI. TOTAL FETAL DEATHS AT TERM ACCORDING TO AGE, RACE, AND PARITY

	AGE - 16		17 - 19		20 - 24		25 - 29		30 - 34		35 - 39		40 -		TOTAL
	TOTAL DELIV.	FETAL DEATHS	TOTAL DELIV.	FETAL DEATHS	TOTAL DELIV.	FETAL DEATHS	TOTAL DELIV.	FETAL DEATHS	TOTAL DELIV.	FETAL DEATHS	TOTAL DELIV.	FETAL DEATHS	TOTAL DELIV.	FETAL DEATHS	
White para 0	285	16	1276	40	1579	72	474	34	169	15	74	8	21	2	3878 187
Black para 0	745	46	1841	102	1097	67	247	23	67	10	36	5	4	0	4037 251
White para x	5	1	193	8	962	26	994	45	755	51	458	48	181	31	3548 210
Black para x	23	1	459	27	1150	79	673	48	338	49	207	41	73	17	2923 262
Total para 0	1030	62	3117	142	2676	139	721	55	236	25	110	13	25	2	7915 438
Total para x	28	2	652	35	2112	105	1667	93	1093	100	665	89	254	48	6471 472
Total white	290	17	1469	48	2541	98	1468	79	924	66	532	56	202	33	7426 397
Total black	768	47	2300	129	2247	146	920	69	405	59	243	46	77	17	6960 513
Total pts.	1058	64	3769	177	4788	244	2388	148	1329	125	775	102	279	50	14,386 910

FETAL MORTALITY PERCENTAGE

AGE	-16	17-19	20-24	25-29	30-34	35-39	40-	TOTAL
White para 0	5.61	3.13	4.56	7.17	8.88	—→10.53←—		4.82
Black para 0	6.17	5.54	6.11	8.50	14.93	—→12.50←—		6.22
White para x	—→4.55←—		2.70	4.53	6.75	10.48	17.13	5.92
Black para x	—→5.81←—		6.87	7.13	14.50	19.81	23.29	8.96
Total para 0	6.02	4.55	5.19	7.63	10.59	—→11.11←—		5.53
Total para x	—→5.44←—		4.97	5.58	9.15	13.38	18.90	7.29
Total white	5.86	3.27	3.86	5.38	7.14	10.53	16.34	5.35
Total black	6.12	5.61	6.50	7.50	14.57	18.93	22.08	7.37
Total pts.	6.05	4.70	5.10	6.20	9.41	13.16	17.92	6.33

The total fetal mortality is 9.51 per cent. This rather high figure is due to the presence of many premature labors in the series and in Table VI only those children born at or near term (2500 grams and over) are included, whereby the mortality is decreased to 6.33 per cent. The total mortality rates are of course considerably lower in this table than.

TABLE VII. FETAL MORTALITY ACCORDING TO TYPE OF DELIVERY

	FULL-TERM SPONTANEOUS			FULL-TERM OPERATIVE			PREMATURE		
	TOTAL DELIV.	FETAL DEATHS	MORTALITY PER CENT	TOTAL DELIV.	FETAL DEATHS	MORTALITY PER CENT	TOTAL DELIV.	FETAL DEATHS	MORTALITY PER CENT
White para 0	2942	75	2.55	936	112	11.97	179	87	48.60
Black para 0	3344	101	3.02	693	150	21.65	310	146	47.10
White para x	2981	85	2.85	567	125	22.05	190	127	66.84
Black para x	2388	126	5.28	535	136	25.42	293	189	64.51
Total para 0	6286	176	2.80	1629	262	16.08	489	233	47.65
Total para x	5369	211	3.93	1102	261	23.68	483	316	65.42
Total white	5923	160	2.70	1503	237	15.77	369	214	57.99
Total black	5732	227	3.96	1228	286	23.29	603	335	55.56
Total pts.	11,655	387	3.32	2731	523	19.15	972	549	56.48

TABLE VIII. SIGNIFICANCE OF DIFFERENCES IN MATERNAL AND FETAL MORTALITY, ACCORDING TO RACE AND PARITY

	DIFF.	DIFF. σ DIFF.	P. ¹
<i>Maternal Mortality</i>			
Total cases, white vs. black	0.0030	2.10	35.8 in 1000
Primiparae, white vs. black	0.0027	1.62	105.2 in 1000
Multiparae, white vs. black	0.0038	1.54	123.6 in 1000
Full-term spontaneous, white vs. black	0.0005	0.58	562.0 in 1000
Full-term operative, white vs. black	0.0058	1.03	303.0 in 1000
Premature, white vs. black	0.0152	1.25	211.2 in 1000
F.T.S. para O, white vs. black	0.0011	1.25	211.2 in 1000
F.T.O. para O, white vs. black	0.0045	0.73	456.4 in 1000
Premature para O, white vs. black	0.0196	1.24	215.0 in 1000
F.T.S. para X, white vs. black	0.0003	0.19	849.4 in 1000
F.T.O. para X, white vs. black	0.0055	0.54	589.2 in 1000
Premature para X, white vs. black	0.0113	0.61	541.8 in 1000
White para O vs. para X	0.0042	2.33	19.8 in 1000
Black para O vs. para X	0.0053	2.27	23.2 in 1000
Total cases para O vs. para X	0.0046	3.13	1.8 in 1000
<i>Fetal Mortality</i>			
Total cases, white vs. black	0.0335	7.07	1 in 1000
Primiparae, white vs. black	0.0238	4.05	1 in 1000
Multiparae, white vs. black	0.0495	6.41	1 in 1000
Full-term spontaneous, white vs. black	0.0126	3.78	1.2 in 1000
Full-term operative, white vs. black	0.0752	4.92	1 in 1000
Premature, white vs. black	0.0243	0.74	459.4 in 1000
F.T.S. para O, white vs. black	0.0047	1.13	258.4 in 1000
F.T.O. para O, white vs. black	0.0968	5.12	1 in 1000
Premature para O, white vs. black	0.0150	0.32	749.0 in 1000
F.T.S. para X, white vs. black	0.0243	4.42	1 in 1000
F.T.O. para X, white vs. black	0.0337	1.32	186.8 in 1000
Premature para X, white vs. black	0.0233	0.53	596.2 in 1000
White para O vs. para X, full term	0.0110	2.08	37.6 in 1000
Black para O vs. para X, full term	0.0274	4.21	1 in 1000
Total cases para O vs. para X, full term	0.0176	4.26	1 in 1000

P.¹=probability of observed difference being due to chance.

in the preceding one which includes premature births, but otherwise the same differences are observed for race, age, and parity as have been previously discussed.

In Table VII, the fetal mortality rates are given according to whether the child is full-term or premature (the latter including all infants weighing between 1500 and 2500 gm. at birth). The full-term labors are divided according as delivery was spontaneous or operative. A study of this table shows that the mortality among premature infants is very high (56.48 per cent), and is considerably increased in the multiparous over the primiparous women. Very little racial difference is here noted, although contrary to the rest of our figures there is a slightly higher mortality among the whites. This finding, however, might be expected when one takes into consideration the fact that the black infant at birth averages between 250 and 300 gm. less than the white.

The difference in the mortality percentage between spontaneous and operative delivery at term is surprisingly high for both races, being about six times as great in the latter group. This would seem to indicate further the benefits of rational conservatism in obstetrics, or earlier interference at a more opportune time in such cases as require operative aid. Attention is again drawn to the higher rate among the multiparae and in the black race.

CONCLUSIONS

1. The gross maternal mortality in a series of 15,370 women delivered after the child has reached the period of viability is 0.79 per cent.

2. Division of the maternal cases according to parity and type of delivery shows that the maternal death rate is consistently higher in the black than in the white race.

3. In this series the mortality rate is higher in multiparae than in primiparae. This is probably due in great part to an abnormal multiparous population.

4. The maternal mortality is lowest following spontaneous delivery at term, increases in the operative type, and is highest when pregnancy terminates prematurely.

5. An increasing mortality is noted in the older age groups, although the girl under seventeen is not an ideal obstetric risk. The optimum age for both races is between seventeen and nineteen years, inclusive.

6. Approximately two-thirds of the maternal deaths are due to infection, toxemia, and hemorrhage. The death rate from infection is almost four times as high in the colored as in the white race. Death from hemorrhage occurs about equally frequently in the two races, while actually more white than black women succumb to toxemia. In our entire series, more deaths resulted from toxemia than from infection.

7. The fetal mortality is significantly higher in the black race; it is also increased in the multiparous women.

8. The fetal death rate increases with advancing age of the mother. The optimum age is seventeen to nineteen years, inclusive, while the results are poorer in the very young woman.

9. Omitting premature infants weighing less than 2500 gm., the still-born and neonatal death rate is 6.33 per cent.

10. The fetal death rate is about six times greater after operative than after spontaneous delivery at term.

THE BROMSULPHALEIN TEST FOR LIVER FUNCTION IN TOXEMIAS OF PREGNANCY

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CLINICAL evidence of renal dysfunction is pronounced in all cases of toxemia of pregnancy, but the phase of liver dysfunction has only recently been investigated, and the interpretation of the results is still far from satisfactory. Phenoltetrabromphthalein-disodium-sulphonate, commercially known as Bromsulphalein, has been estimated to be of value in testing liver function in this variety of toxemia, and previous to the use of this compound, another halogenated phthalein, phenoltetrachlorphthalein, was assumed to have a similar value, according to D'Amory, Krebs and Dieckman, Rosenfeld and Schneider and other investigators. Unfortunately, the intravenous injection of this latter drug caused untoward reactions which discouraged its use, but in 1925, Rosenthal and White discovered the nonirritating properties of bromsulphalein and attention was eventually turned to the use of this dye as a test for liver function in abnormal pregnancy. During the last four years several papers have been published on this subject. To note the general conclusions reached we shall give partial summaries of two of these.

E. S. King, in 1926, by injecting 5 mg. of bromsulphalein per kilogram of body weight and withdrawing a blood sample at the end of one-half an hour, claimed that the percentage of the dye above zero retention, measured colorimetrically, was proportionate to the degree of liver injury present in abnormal cases. There were no data given for normal pregnant women. In the cases of mild toxemia, and in cases where the toxemia was of nephritic origin, the test was negative. In 10 cases of eclampsia, 7 showed dye retention varying from a trace to 40 per cent, and in some cases there was retention on repetition of the test as late as eight days postpartum. All of the patients recovered. Three cases where no retention occurred were classified as "mild eclampsia," "error in technic," and "complicated by chronic nephritis." Three cases of hyperemesis gravidarum showed dye retention varying from 10 to 25 per cent. The degree of retention in all cases was correlated to the severity of the clinical findings.

In 1927, I. A. Siegal, reporting on this same subject, used 2 mg. of bromsulphalein per kilogram of body weight in comparison with King's 5 mg. and withdrew blood samples at the end of a half hour. Their results show wide discrepancies. Siegal's, briefly, were as follows: Sixty-two normal pregnancies showed no

retention of the dye, and eight apparently normal pregnancies showed retention varying from 1 to 3 per cent. Forty-two patients having undifferentiated toxemia manifested by hypertension, albuminuria, and edema showed bromsulphalein retention varying from zero to 5 per cent. Twenty-six patients in this category showed no retention. Six cases of nephritic toxemia had no apparent retention, and, finally, 6 patients with eclampsia eliminated all but amounts from a trace to 3 per cent of the dye. Two patients with hyperemesis gravidarum retained a trace and 1 per cent respectively. The high retentions reported by King were conspicuously absent. Siegal concludes that the test is valuable in diagnosing the degree of toxicity; in differentiating nephritic from preeclamptic toxemia; and in differentiating neurotic from toxic vomiting. He states that perhaps the test is useful as an aid to prognosis in eclamptic cases.

Ordinarily, 2 mg. of bromsulphalein are eliminated entirely in thirty minutes. Because of difficulties in colorimetric reading of this amount, work carried on in the New Haven Hospital in 1926, by Kunkel showed that 5 mg. per kilogram of body weight were removed from the blood in forty-five minutes. No toxic effects followed the injection of this quantity. In the present study, 5 mg. per kilogram of body weight were chosen as standard.

TABLE I. NORMAL PREGNANCY*

CASE	BLOOD PRESSURE	ALBUMINURIA	PER CENT DYE RETENTION AFTER	
			30 MINS.	45 MINS.
1	Normal	0	Trace	0
2	Normal	0	5	0
3	Normal	0	Trace	0
4	Normal	0	Trace	0
5	Normal	0	0	0
6	Normal	0	5	0
7	Normal	0	10	Slight trace
8	Normal	0	Trace	0
9	Normal	0	Trace	0
10	Normal	0	Slight trace	0
11	Normal	0	5	0
12	Normal	0	Trace	0
13	Normal	0	Trace	0
14	Normal	0	Trace	0
15	Normal	0	Trace	0
16	Normal	0	15	Slight trace
17	Normal	0	Trace	0
18	Normal	0	5	Slight trace
19	Normal	0	Trace	0
20	Normal	0	Trace	0

*Slight trace, just appreciable color. Trace, 1 to 4 per cent.

Injections on the calculated basis were given directly into the median antebraclial vein, and blood was withdrawn from the opposite arm into absolutely dry apparatus to prevent hemolysis. By centrifuging after coagulation took place straw colored serum was always obtained. Some of this was alkalinized to bring out the color of the dye and compared with prepared standards and the nonalkalinized serum in a suitable comparator.

In this investigation patients selected for the test were divided into four groups:

1. Twenty women in the last month of normal pregnancy.
2. Seven women with exaggerated vomiting of pregnancy.
3. Thirteen women in whom pregnancy in the last trimester was associated with hypertension, albuminuria, and edema.
4. Eleven women in whom pregnancy in the last trimester was associated with convulsions.

GROUP I. NORMAL CASES. TABLE I

As noted above, each of these normal pregnant women received 5 mg. of bromsulphalein per kilogram of body weight. In the calculation on this basis, the weight of the fetus, amniotic fluid and placenta is included, and thus it is clear that in these cases a quantity of dye actually exceeding 5 mg. per kilo. has been given. However, as can be seen in Table I, the liver normally removes bromsulphalein from the circulation so rapidly that in uncomplicated pregnancy the blood serum contains a barely appreciable quantity of the dye forty-five minutes after its injection. Incidentally, as might be predicted, analysis of the cord blood in two patients who delivered within a half hour after administration of the dye, failed to demonstrate any transfer of the bromsulphalein across the placental barrier.

GROUP II. TABLE II

Of the 7 cases tabulated all but one were in the interval between the first and second trimester and 5 showed no retention of bromsulphalein. One patient in the first trimester entered the hospital following vomiting of five weeks' duration and was notably dehydrated. She began to improve following infusions of saline and glucose but was removed from the clinic before the vomiting had been wholly controlled. Three weeks later, after an interval of no treatment, she was rushed to another hospital where two days after admission she died. At autopsy there were found marked degeneration of the convoluted tubules of the kidneys and degeneration of the central portions of the liver lobules.

The other patient showing retention of bromsulphalein entered the hospital late in the second trimester after having been vomiting for four months. On admission she complained in addition to the vomiting, of urinary frequency and burning and on examination there was tenderness in the right costovertebral angle. Urine examination and cystoscopy revealed a *B. coli* pyelitis on the right, and the vomiting was thought to be a persistent reflex associated with the urinary tract infection. Treatment consisted of urinary antiseptics, the establishment of ureteral drainage by giving large volumes of saline and glucose by infusion and hypodermoclysis. For several days the vomiting was somewhat improved when, within twenty-four hours, the sclerae and skin became intensely jaundiced, and vomiting again increased. The pregnancy was terminated by abdominal hysterotomy. The jaundice disappeared as rapidly as it came and the patient had an uneventful recovery.

GROUP III. TABLE III

In the second group of 13 patients with hypertension, albuminuria, and edema but without convulsions, one gave a history of hypertension and another of edema in a previous pregnancy. A third patient had a previous history of pyelitis and cystitis, and had evidence of urinary infection on admission. In this group, 8 patients showed no retention of the dye. In 5 the test gave a positive result, although in no instance was the retention of the dye greater than 5 per cent. However, the absence of liver dysfunction, as indicated by the results of the test, in no way lessened the severity of the clinical picture. In 9 patients early

TABLE II. EXAGGERATED VOMITING OF PREGNANCY*

NO. AGE PARA.	PREV. TOX.	GEST. B.P.	URINE		BLOOD CHEM.	PHTHALEIN		RETENTION	REMARKS
			ALB. CASTS	W.B.C. ACETONE CULTURE		2 HR. 10 MIN.	EDEMA		
1 28	i —	3 mo. 120 80	0 0	Clumps H.T. B. coli	25 mg.	60%	Normal No	0	Recovered
2 24	i —	2 mo. 80 40	0 0	0 T. Neg.	24 mg.	55%	Normal No	0	Recovered
3 29	iii No	3 mo. 104 70	F.T. 0 0	0 T. Neg.	30 mg.	60%	Normal No	0	Recovered
4 20	i —	4 mo. 130 70	T. 0	Few T. Not taken	31 mg.	55%	Normal No	0	Recovered
5 23	iv Pyelitis in 3 mo. 3rd. Preg.	110 60	F.T. 0 0	0 H.T. B. coli	38 mg.	55%	Normal No	10%	Left hospital against advice. Died four weeks later. Autopsy; liver 900 gm. Central lesions.
6 25	iv No	3 mo. 122 85	F.T. 0 0	0 T. Neg.	34 mg.	70%	Normal No	0	Recovered
7 29	i —	6 mo. 118 80	0 0	Clumps T. B. coli Bile H.T.	26 mg.	65%	Normal No	20%	Developed icterus. Abdominal hysterectomy. Recovered. Dye retention third day postoperative zero

*H. T., heavy trace. T., trace. F. T., faint trace.

TABLE III. HYPERTENSION, ALBUMINURIA, AND EDEMA WITHOUT CONVULSIONS

NO. AGE PARA. PREV. TOX.	GEST. B.P.	ALB. CASTS	URINE W.B.C. R.B.C.	CULTURE	BLOOD PHOSPHORUS N.P.N. LEIN	RETINAE	EDEMA RETENTION	REMARKS
1 23 i	8 mo. $\frac{144}{100}$							
2 20 ii	Hypertension 9 mo. $\frac{148}{110}$ First Preg.	H.T. Rare	Clumps Rare	Staph. A	38 mg. 50%	Sl. edema rt. disc	Gen. Trace	Labor induced. Spontaneous delivery. Recovery uneventful
3 35 i	8 mo. $\frac{160}{100}$	T. 0	0 0	Neg.	30 mg. 65%	Mod. bilat. edema both discs	Feet and ankles 0	Labor induced. Spontaneous delivery. Recovery uneventful. Blood pressure on discharge 140/100
4 30 iii	9 mo. $\frac{210}{130}$	T. Rare	Clumps 0	B. coli	30 mg. 50%	Early Sclerosis arteries and Edema both discs	Feet 5%	Cesarean section. Uneventful recovery. Liver function test twenty-four hours after operation showed no retention of dye
5 35 i	9 mo. $\frac{154}{100}$	H.T. Rare	Few 0	Neg.	34 mg. 50%	Albuminuria nephroretinitis	Ankles 0	Labor induced. Recovery uneventful. Blood pressure on discharge 152/100
6 35 i	7 mo. $\frac{160}{90}$	T. 0	0 0	Neg.	26 mg. 60%	Normal	Feet 0	Spontaneous labor and delivery blood pressure on discharge 130/90
7 21 i	8 mo. $\frac{170}{90}$	H.T. 0	Few 0	Not taken	30 mg. 55%	Early sclerosis retinal arteries	Back and feet Trace	Termination of pregnancy. Uneventful recovery. Blood pressure on discharge 120/80
		T. 0	Clumps 0	B. coli	22 mg. 60%	Bilat. edema of discs	General Trace	Labor induced; delivery spontaneous. Recovery. Blood pressure 120/70

TABLE III. (Continued)

NO.	AGE	PARA.	PREV. TOX.	GEST. B. P.	ALB. CASTS	URINE W. B. C. R. B. C.	CULTURE	BLOOD PITUITA- N. P. N. LEIN	RETINAE	EDEMA RETENTION	BROMSUL- PHALEIN	REMARKS
8	39	v	No	8 mo. 160 110	T. 0	Few 0	Not taken	30 mg. 55%	Sclerosis of arte- ries	None	0	Spontaneous premature la- bor. Recovery. Blood pres- sure 130/80
9	39	i	Pylitis 6 yr. prev.	8 mo. 170 100	II. T. Few	Num. 0	B. coli	43 mg. 50%	Bilat. edema of discs	General	5%	Elective cesarean section. Recovery. Blood pressure 110/70
10	28	iv	None	7 mo. 180 110	T. 0	Rare 0	Neg.	30 mg. 50%	Normal	None	0	Fetus died in utero. Labor induced. Patient recovered. Blood pressure on dis- charge 130/90
11	38	xiv	None	7 mo. 200 140	II. T. Few	Few 0	Staph. A.	46 mg. 45%	Hemorrhagic ret- initis	Gen.	Trace	Fetus died in utero. Labor induced. Recovered. Blood pressure 160/90
12	24	iii	Edema 2nd preg.	8 mo. 156 102	II. T. Num.	Few 0	Staph. A.	22 mg. 50%	Normal	Gen.	0	Labor induced. Spontane- ous delivery. Final blood pressure 130/70
13	21	i	—	9 mo. 160 100	T. Few	Few 0	B. coli	20 mg. 55%	Normal	Face and Ankles	0	Spontaneous labor and re- covery

TABLE IV. TOXEMIA WITH CONVULSIONS

NO.	AGE	PARA.	PREV. TOX.	GEST. B. P.	URINE			BLOOD N. P. N.	PHTHAL-LEIN	RETINAE	BROMSUL-PHALEIN RE-EDEMA TENTION		REMARKS
					ALB. GM./L	CASTS	W. B. C.	R. B. C.	CULTURE				
1	35	iv	None	8 mo. $\frac{170}{110}$	14	Num.	Few	0	B. coli	32 mg.	55%	Bilat. edema of discs	Two convulsions. Labor induced. Spontaneous delivery dead fetus. Hem. Staph. infection—died 14 days post-partum
2	29	i	—	7 mo. $\frac{180}{100}$	5	Few	Few	0	Neg.	29 mg.	40%	Edema discs and early sclerosis of arterioles	Two convulsions. Pulmonary Edema and cardiac collapse. Died undelivered three days after admission.
3	32	v	Convulsions second and third pregnancies	1 day $\frac{148}{90}$ p. p.	7	Few	Few	0	Not taken	70 mg.	Not obtained	Edema both discs	Several convulsions followed by death three days post-partum
4	32	i	Preexisting hypertension and nephritis	7 mo. $\frac{170}{120}$	1	0	Few	0	Neg.	37 mg.	30%	Bilat. optic neuritis and retinitis	One convulsion. Elective section and premature delivery. Recovery uneventful. Blood pressure on discharge 140/90
5	43	vi	11 year interval between pregnancies	8 mo. $\frac{180}{110}$	4	Few	Num.	0	B. coli	39 mg.	35%	Edema discs. Detached retina on right	Four short convulsions. Spontaneous onset of labor; instrumental delivery. Normal puerperium.
6	22	i	—	9 mo. $\frac{152}{100}$	1	Few	Few	0	Neg.	32 mg.	60%	Not examined	Labor induced. Three convulsions during first stage. Instrumental delivery. Puerperium febrile causes?

TABLE IV (Continued)

NO.	AGE	PARA.	PREV. TOX.	GEST. B.P.	URINE				BLOOD N.P.N.	PHTHA- LEIN	RETINAE	BROMSUL- PHALEIN RE- EDEMA TENTION		REMARKS
					ALB. GM./L	CASTS	W.B.C.	R.B.C.						
7	19	i	—	7 mo. $\frac{190}{120}$	7.5	Num.	Few	0	B. coli	40 mg.	Not satis- factory	Edema of discs	Ankles 20%	Three convulsions. Labor in- duced and spontaneous de- livery of dead fetus. Re- covery uneventful. Final blood pressure 120/80
8	30	i	—	9 mo. $\frac{168}{100}$	1.5	Num.	Few	0	S. aureus	25 mg.	70%	Bilat. edema of discs and retinal hemorrhages	Legs 0	One convulsion. Labor in- duced and delivery by ver- sion. Fetus normal. Recovery uneventful. Blood pressure 130/70
9	32	viii	None	8 mo. $\frac{180}{110}$	5	Few	Few	0	S. aureus	35 mg.	Not satis- factory	Edema of discs	Feet 0	Six convulsions. Labor in- duced. Spontaneous delivery and good recovery. Final blood pressure 190/130—18 days postpartum
10	24	ii	None	8 mo. $\frac{145}{110}$	10	Num.	Few	0	S. aureus	32 mg.	55%	Edema of discs	Face hands and feet 5%	In labor. Three convulsions and instrumental delivery. Rapid recovery. Discharge blood pressure 120/80
11	15	i	—	8 mo. $\frac{155}{110}$	9	Num.	Few	0	Nonhem.S.	31 mg.	Oli- guria	Edema of discs. Edema of detached lt. retina	Gen. 0	Six convulsions. Labor in- duced and macerated fetus delivered. Slow recovery. Final blood pressure 120/80

sclerotic or albuminuric retinal changes were present as diagnosed by Dr. Eugene Blake of New Haven. In the majority of the group the pregnancy was terminated artificially.

GROUP IV. TABLE IV

Of the 11 patients whose pregnancy was associated with convulsions, one gave a history of a preexisting hypertension and chronic nephritis; a second patient pregnant for the fifth time had convulsions during the second and third pregnancies; and in a third patient the interval between the present and previous pregnancy was eleven years. In this group 5 patients showed no retention of the dye; one showed a trace. Of the remaining, 3 showed a retention of 15 per cent and died, one of infection, and 2 of toxemia. One patient in whom the retention was 20 per cent recovered following the induction of labor and the expulsion of a dead fetus.

SUMMARY

The findings in the tables may be summarized as follows: Of 20 normally pregnant women in the last month of pregnancy, there were 3 whose serum showed a trace of bromsulphalein forty-five minutes after its injection. Of the seven women in the first or second trimester with exaggerated vomiting, two showed marked retention of the dye, the others none. One with retention left the service against advice and died four weeks later in another hospital, the other developed acute jaundice and recovered after termination of the pregnancy. In the group composed of 13 women with hypertension, albuminuria and edema unassociated with convulsions, the retention of the dye was in no instance greater than 5 per cent. However, in these patients the clinical picture, in spite of the absence of liver dysfunction, was grave. In 9, sclerotic or albuminuric retinal changes were present, and in the majority pregnancy was artificially terminated. In the last group where pregnancy was associated in the last trimester with toxemia and convulsions, 5 showed not more than a trace of retention. Three in whom the retention was 15 per cent died, one from postpartum infection, and the others from the toxemia antepartum. In contrast the patient, who of the entire group showed the highest percentage of retention, 20 per cent, recovered following the induction of labor.

COMMENT

In interpreting the results of this investigation, it is essential that we remember that the retention of bromsulphalein indicates only a degree of impaired liver function and not actual liver pathology. The question arises as to how much the liver must be damaged before that injury can be shown by functional tests. This question has been somewhat answered by the results of animal experimentations. Rosenthal found that 12 per cent of the liver of rabbits must be removed before variations in the excretion of phenoltetraehlorphthalein can be detected, and Rous and McMaster found that one-fourth of the liver in rats will maintain normal function. Undoubtedly there are great variations in the amount of damage that will impair function, and how much of

the human liver will support normal function is unknown. We do know, however, that all organs functionally have a large factor of safety, and thus while a negative test for liver function does not indicate that pathologic changes are absent, a positive case does indicate that the safety limit for the functioning of that organ is exceeded. What alteration of function over the safety limit would be fatal to the individual is also unknown, but Baronberg, in studying liver function in acute infectious diseases, frequently found alterations in liver function in the acute stages of pneumonia that were comparable to those encountered in inflammatory and degenerative hepatopathies; and in these cases, function again became normal with recovery from the disease.

It is noticeable in the present investigation that in toxemias late in pregnancy liver dysfunction even in fatal cases did not exceed 15 per cent, except in one instance where it was 20 per cent and that patient recovered. Moreover, those cases which showed any retention above a trace could not be considered more critically ill from a clinical viewpoint than most of the others who showed no evidence of liver dysfunction. It, therefore, seems improbable that the gravity of the situation in cases late in pregnancy can be pronounced proportional to such relatively small degrees of liver dysfunction. Of more significance, however, are the evidences of liver dysfunction early in pregnancy. Here where there is a question between an uncontrolled reflex phenomenon or the establishment of a vicious cycle of vomiting which has gradually brought about organic changes, retention of bromsulphalein can be regarded as an aid to diagnosis, and probably to estimate response to treatment. Nevertheless, it is our opinion that, from the clinical picture alone in such cases, one cannot defer treatment too long on the basis of this single observation.

CONCLUSIONS

In this small number of cases we feel the following facts have been established:

1. In normal pregnant women, the blood serum showed at most a barely appreciable retention of bromsulphalein forty-five minutes after the injection of the dye in amount somewhat in excess of 5 mg. per kilo.

2. The serum of women whose pregnancy was early associated with exaggerated vomiting showed marked retention of the dye in two cases which could be said to have gone on to a toxic state, although the factor of infection must be considered in one of these.

3. Of 13 women whose pregnancy was associated in the last trimester with hypertension, albuminuria and edema, 2 showed a retention in the serum of 5 per cent; 11 had a retention of zero or but a trace.

4. In 11 women whose pregnancy was complicated in the last trimester with toxemia and convulsions, there was in 4 no retention of the dye, and in one but a trace. In the 3 whose serum showed a retention of 15 per cent, one died of a postpartum infection and the others of

the toxemia antepartum. In contrast, an additional patient whose serum retained 20 per cent of the dye, the highest percentage in the entire group, recovered following the artificial termination of the pregnancy.

5. From a study of this group of cases, we find the bromsulphalein test of value in determining the degree of toxicity in exaggerated vomiting cases in early pregnancy; but we are unable to convince ourselves of its value late in pregnancy either as a means for differentiating the nephritic from the eclamptic toxemia or as an aid in predicting the outcome in these conditions.

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CALCIUM AND INORGANIC PHOSPHORUS CONTENT OF PRENATAL AND POSTPARTUM SERUM

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EVER since the development of modern methods of chemical blood analysis, the significance of the variations of the calcium and inorganic phosphorus of the serum, especially during pregnancy, has been the subject of interest and study.

Although Morley¹ in 1913, using the method and arbitrary standard of Bell² reported a lowering of serum calcium during pregnancy, labor, and puerperium, most of the early workers were agreed that the calcium concentrations remained within the limits of the accepted normal range of 9 to 11 mg. of calcium per 100 c.c. of serum.

In 1923, Widdows³ introduced the innovation of following individual cases over an extended period. By this method she reached the conclusion that there was a tendency, first, to a decrease in the calcium content of the blood in late pregnancy, which was not manifest in all cases, and later, to a rise directly after confinement, even during lactation. The results of this work also called into question the validity of the accepted normal range of serum calcium.

Denis and King⁴ reported that the serum calcium in 64 cases of normal pregnancy ranged between 10.2 and 11.9 mg., averaging 10.8 mg. Since this series included cases from the second to the ninth month, it would seem to indicate that the calcium concentration does not fall even during the latter months of gestation. No attempt was made, however, to determine individual variation; the series

was composed of single determinations on 64 cases. Handelsman, Rose, and Sherwin⁵ supported this view, finding calcium concentrations normal during gestation with 11.3 mg. average for the sixth, seventh, eighth, and ninth months. They found a slight decrease immediately after parturition, but a rise to a high normal before dismissal. They made repeated observations but used only 10 cases, less than half of which had a complete series of determinations. Their conclusions, therefore, cannot be accepted as final.

Serdyukov and Morosova⁶ likewise failed to find any change in calcium concentration during pregnancy. They found a rather high normal, 9.0 to 13.7 mg., average 11.25 mg., for 45 cases, and little variation from this range during the first half of pregnancy, the latter half, or childbirth, although the average during childbirth (7 cases) was slightly lower than for the first or second half of pregnancy (19 and 50 cases respectively). In cord blood, however, the concentration ran definitely higher.

In opposition to these views, Stieglitz⁷ found a mild hypocalcemia during the last months of pregnancy, a rise after delivery, and a transient fall in calcium at the onset of lactation. Quoting Wyss⁸ and Anderson⁹ for his standards, he found that practically all of his determinations fell within the normal range: 88 per cent were between 9 and 13 mg. and 60 per cent between 10 and 12 mg. Bokelmann and Bock¹⁰ also reported a slight decrease in total calcium of the serum during pregnancy, but they found it relatively high, an actual increase, at the onset of delivery, although it fell again to the low level of the latter half of the pregnancy by the end of the delivery.

Cautarow, Montgomery and Bolton¹¹ summed up the recent literature with the conclusion that total serum calcium diminishes during the latter months of pregnancy, but is usually above the lower normal limit. They attributed symptoms to variations in the distribution of diffusible and nondiffusible forms. Dumble¹² agreed that there is a fall. Using 10 cases he found 9.36 mg. for the second half of pregnancy, 9.75 immediately after delivery, and 9.82 on the fifth day postpartum. He gave 9.97 mg. as normal. Harding, Murphy, and Downs¹³ were in close agreement with his postpartum figures. They found 9.7 mg. the average of 136 cases on the tenth day, with a range of 8 to 12 mg.

Hellmuth and Timpe¹⁴ also found that there was a fall in calcium, but their figures were quite different. They gave 10.5 mg. per cent as the average for the nonpregnant normal (range 8.5 to 11.6 mg. in 23 cases), 10.2 mg. for the first, and 9.5 mg. for the latter half of pregnancy, rising to 10.2 mg. in puerperium. They did not find the dializable portion altered.

From this brief survey it is apparent that there still exists a wide diversity of opinion as to what changes in the serum calcium content, if any, actually occur during pregnancy. It is also apparent that the question hinges on what may be considered the normal range of variation. The figures already quoted show that investigators may be divided roughly into two groups, one of which holds that the heretofore accepted range of 9 to 11 mg. is normal for nonpregnant normal women, the other claiming that a higher range is more nearly correct.

Spiegler and Schol¹⁵ assumed the normal average to be about 10.6 mg. on the basis of results quoted from the literature. These included Jansen who gives 9.4 to 11.0, average 10.2 mg.; v. Oettingen average 10.2 mg.; Schoning 10.5 to 11.5 mg.; Kylin 10.6 to 12 mg.; and Rodecrest average 11.97 mg. The 155 determinations they made covering the course of pregnancy from the third month until after delivery were all above 10.0 mg., according to their Curve I.

Bock, on the other hand, found the normal average to run much lower. In a series of articles, Bock^{16, 17, 18} gave normal calcium figures as 9.6 mg., 9.6 to 9.9 mg. (3 cases), and 9.65 mg. (average of 12 cases). Bokelmann and Bock¹⁹ raised these figures to 10.1 mg. per cent for the normal calcium content of blood. Even with such low normal ranges they did find some slight lowering of the calcium concentrations during the latter months of pregnancy, but the variations were so slight, that with the small number of cases reported, some natural doubt arises as to their accuracy.

Higher normal ranges are more frequent. Kylin²⁰ gave 10.6 to 12 mg. with an average of 11.13 mg. For those below twenty-one years of age the average was slightly higher, while above 41 it was somewhat lower. Brems²¹ had a similar range, 10.48 to 13.86, average 11.48 mg. (23 cases). Allen and Goldthorpe²² using the Tweedy process found 19 nurses to come between 9.3 and 13.6 mg. calcium per 100 c.c. of plasma, while Cantarow, Dodek, and Gordon²³ gave 10.09 to 10.45 mg. as normal (6 cases). This is in accord with the figures of Halverson, Mohler, and Bergeim²⁴ for women.

In an attempt to settle this question Rosen and Krasnow²⁵ made a study of 50 medical students, using the Kramer-Tisdall method. They found a range of 10.7 to 13.2 mg., average 11.6 mg. Roe and Kahn²⁶ repeated this work, also using 50 medical students, but making the determinations by their colorimetric method. They found the range to be 9.0 to 11.6, average 10.13 mg. With 46 per cent of the cases falling between 9.0 and 9.9, this seems in complete accord with the old normal range.

In regard to the calcium concentration in the umbilical cord blood, there is entire agreement. Serdyukov and Morosova,⁶ Bokelmann and Bock¹⁷ and Hellmuth²⁸ all found the fetal concentration definitely higher than the maternal, the first named to the extent of about 20 per cent.

Bock¹⁹ found no noticeable change from the normal in the inorganic phosphorus averages during pregnancy, though individual variations are large. He did find a fall, about 10 per cent, postpartum, which returned to normal within a week.

As to calcium and phosphorus metabolism, most investigators seem to agree that there is an unfavorable or negative balance at least during the latter part of pregnancy, and often lasting through lactation. This may be relieved to some extent by additions to the diet.

Observations we have made in our study of the problem favor the higher figures, and, while they do not clear up the problem are of value in that they add to the sum of our knowledge by which the final solution may be reached.

METHOD

Our subjects were dispensary patients, chosen at random. No effort was made to regulate their diets, beyond the usual clinical advice as to milk, fruit, and vegetables. Table I covers a study of such cases during their stay in the hospital. Table II includes only data from patients living at home, with the exception of the figures in column 3. Cases delivered in the hospital (figures in column 3) were discharged at twelve to fourteen days. Table III gives data from home cases coming into the dispensary.

Calcium determinations were made by a modified Kramer and Tisdall³⁰ method. Two cubic centimeters of fresh serum were precipitated with ammonium oxalate

and allowed to stand eighteen to twenty hours. The precipitate was washed, dissolved in normal sulphuric acid, and titrated against freshly diluted and standardized potassium permanganate. This daily standardization of the permanganate also provided an end point for each series of determinations, eliminating the variations due to alteration of the light on different days. Checks on the calcium determinations have been made at intervals during the course of study against known standards; by recovery of calcium added to samples of serum; and by multiple determinations on the same serum. These tests indicate an average error of about one per cent. In view of this, and of the uniformity observed in our determinations, we feel justified in attaching significance to alterations amounting to three per cent or more.

We have made our phosphorus determinations according to the method of Kuttner and Cohen as modified by Kuttner and Lichtenstein²¹ observing certain precautions suggested by Doctor Shohl's laboratory. These included using five standards instead of two, equal to 2.5, 3.75, 5.0, 7.5 and 10 mg. P per 100 c.c. of serum, which permitted all colorimeter readings to be made within 3 mm., plus or minus, of the standard, set at 20 mm. They also included constant stirring during the addition of the stannous chloride; completion of said addition for the entire run in ten minutes with the standards in the middle; twenty minutes aging before reading; and completion of readings in two hours.

The method as employed by us has been tested in the way mentioned above and has been found to have an accuracy of about 6 per cent. Two cubic centimeters of the serum, removed from the clot in from one-half to one hour and a half after drawing, give duplicate tests. Hemolized samples were discarded. The figures given for both calcium and phosphorus are the average of duplicate determinations.

DISCUSSION OF RESULTS

It is at once apparent from a study of Table I that the calcium and inorganic phosphorus in the serum of the fetal blood, as taken from the umbilical cord, is higher than that of the mother. As regards calcium, the values of the cord blood are in every case higher than those of the corresponding maternal blood throughout the entire series. The phosphorus shows but two exceptions, one of which is equal and one higher. Since this finding is in accord with that of previous observers, it may be regarded as a fact in normal cases.

It is also apparent that there is little variation in venous serum calcium among the average values obtained before delivery, at delivery, and two days after delivery. This is substantiated by the additional cases given at the foot of the table. This would indicate that neither the actual exertion of delivery nor the anesthetic has any particular effect on the calcium content of the blood. The phosphorus variations are greater both in the averages and individually, but it would appear that there is an increase at delivery, followed by a fall two days later, and a subsequent rise at seven days postpartum. In the additional cases the average of the few cases shown give at delivery higher venous values than cord; but, since there are so few of these, and they are not from corresponding cases, this fact cannot be regarded as very significant.

Of equal interest is the fact that the calcium values, on the basis of the old normal range, are so high. At the onset of labor the averages given

TABLE I. VARIATIONS BETWEEN MATERNAL AND FETAL SERUM CA AND P.
ALL FIGURES ARE GIVEN IN MG. PER 100 C.C. OF SERUM

CASE	ONSET OF LABOR			DELIVERY				POSTPARTUM				AGE	PARA
	VENOUS BLOOD		HOURS BEFORE DELIVERY	CORD BLOOD		VENOUS BLOOD		SECOND DAY		SEVENTH DAY			
	CA	P		CA	P	CA	P	CA	P	CA	P		
1	9.8	3.7	3	10.8	5.1	9.3	4.0	9.5	3.9	9.8	4.4	20	i
2	9.7	5.4	5	11.0	7.3	9.6	5.8	9.6	4.1	9.5	5.0	20	i
3	9.2	4.2	4	11.0	6.5	9.1	2.9	9.6	4.0	9.8	3.9	30	v
4	9.5	3.3	3	12.6	5.2	10.2	3.7	10.4	3.7	10.5	4.3	17	i
5	9.2	2.7	3.5	11.5	5.5	9.3	3.7	10.0	3.9	10.3	4.1	30	iii
6	9.6	4.0	5	11.1	6.1	9.8	5.1	9.6	3.6	10.3	4.6	18	ii
7	9.2	3.5	11	11.6	7.6	9.2	6.5	9.4	4.0	9.9	3.8	26	i
8	9.8	3.9	6	10.9	7.1	10.0	5.4	9.5	3.5	9.9	4.7	19	i
9	10.2	4.9	16	11.9	6.3	9.9	5.5	9.8	3.6	10.4	3.8	19	i
10	9.6	3.0	3	13.1	6.5	9.8	4.1	11.0	3.8	10.2	4.2	20	i
11	9.3	3.5	2	12.9		9.6	3.8	9.8	ppt.	10.2	3.8	21	i
12	9.9	3.6	5.5	11.6	3.8	9.9	3.7	10.2	3.8	10.1	4.6	23	i
13	9.6	3.8	7.5	12.0	7.2	9.9	5.1	9.3	3.4	10.1	3.8	23	i
14	9.5	3.9	8	11.9	5.7	10.4	5.0	10.0	3.2	10.7	4.6	32	i
15	10.0	4.1	7	11.9	7.1	10.0	6.1	10.0	4.0	10.1	4.0	17	i
16	9.1	3.6	2.5	10.2	5.6	9.1	4.6	8.9	3.6	9.3	4.1	31	vi
17	10.2	3.6	7	12.5	5.6	10.3	5.2	10.2	3.8	9.7	4.1	20	i
18	9.6	3.4	3.5	11.1	5.4	10.0	3.8	9.9	3.7	10.5	ppt.	26	i
19	10.2	3.9	7	11.7	5.9	10.1	4.4	10.4	4.7	10.9	4.9	28	ii
20	10.2	2.5	7	11.2	4.8	9.9	3.7	9.3	2.3	10.6	4.1	19	i
AV.	9.7	3.7	5.8	11.6	6.0	9.8	4.6	9.8	3.7	10.1	4.3	23	
Additional cases of incomplete series													
NO. OF CASES	24	20		16	15	10	9	15	12	21	19		
AVER-AGE	10.0	3.6		11.8	5.6	10.2	6.3	10.1	3.9	10.5	3.8		

are 9.7 mg. and 10.0 mg. per 100 c.c. of blood, with 9.1 mg. the lowest for the entire forty-four. The average delivery figures are almost identical with these, as are also those of the second day postpartum, shading up if anything. The seventh day shows a definite rise. In the whole table, including the additions at the bottom, there is only one value below 9.0, and that, 8.9 mg., was from the mother of twins on the second day postpartum.

These figures are substantiated by the values given in Table II, where again there is only one determination below 9.0, also 8.9 mg. The averages of 9.9 mg. for six weeks and two weeks before delivery fit in well with the onset of labor values of Table I, and indicate one of two things; either that calcium does not fall during the latter part of pregnancy; or, that the supposed normal range of 9.0 to 11.0 is too low. If the latter supposition is true, it explains the failure of many investigators to observe a fall in serum calcium during pregnancy. The postpartum figures might be taken as an indication favoring this latter view, with averages

of 10.5 mg. and 10.4 mg. respectively. It is worth noting that after six weeks 31 cases, most of which were nursing, gave only four figures below 10.0 mg., the lowest being 9.5 mg.

The 21 additional cases presented in Table III give the same average as those in Table II, 10.4 mg. per 100 c.c. for six weeks postpartum. Here 4 of the 5 cases where the baby was not being nursed by the mother fall below the average figure, while the 4 shown at seven, eight, and twelve weeks all equal or surpass it. The range here is also high, with only 4 cases below 10.0 mg., the lowest being 9.4 mg. Tests conducted on 60 normal, nonpregnant young women are in entire accord, averaging 10.4 mg., with 9.3 the lowest of the five values found below 10 mg.

The phosphorus averages of Table II fit in well with those of Table I. The predelivery figures are a little lower than those at onset of labor, but

TABLE II. SERUM CALCIUM AND INORGANIC PHOSPHORUS BEFORE AND AFTER DELIVERY

ALL FIGURES ARE GIVEN IN MG. PER 100 C.C. OF SERUM

CASE	BEFORE DELIVERY				POSTPARTUM				REMARKS
	6 WEEKS		2 WEEKS		12-14 DAYS		6 WEEKS		
	CA	P	CA	P	CA	P	CA	P	
45	9.3	2.5			10.9	4.1	10.9	3.6	
46	10.5	3.6	11.0	3.4			10.3		Nursing
47	10.6	3.6					10.5	3.2	Sup. feeding (7 wk.)
48	9.8	3.5			10.5	4.0	10.0	3.9	
49	10.7	2.9	9.9	3.5	11.5	4.1	10.6	3.7	Nursing
50			10.0	3.8	10.8	4.0	11.1	4.3	Nursing
51	10.0	3.0					10.2	3.4	Nursing
52	9.8	3.4			10.4	4.1	10.2	2.8	
53	9.6		9.1	3.4			11.1	3.9	Nursing
54	9.7	2.5	10.5	2.7	10.0	3.4	9.9	2.7	Nursing
55	9.5	3.3					9.9		Nursing
56			8.9	3.5	11.9	4.4	10.4	5.1	Nursing
57	10.0	2.9					10.3	3.5	Baby stillborn
58			9.5	3.5			10.3	3.6	Nursing (7 wk.)
59	9.8	3.1	10.2	3.0	10.0	5.1	10.4	4.0	Not nursing
60			10.2	2.8	10.2	4.2	10.8	4.4	Nursing
61	10.3	2.9					10.5	3.8	Nursing
62					10.0	5.2	10.4	3.7	Nursing
63	9.3	4.0	9.5	3.8			10.4	4.4	Nursing
64	11.0	3.4					10.6	3.7	Nursing
65	10.1	4.3	9.9	4.0			10.3	3.5	Nursing
66			9.7	2.9	10.3	6.3	10.6	3.9	Nursing
67	9.6	3.2	10.2	3.6	10.9	3.9	10.2	5.0	Nursing
68	9.9	2.9	9.0	2.7	10.0	4.5	9.8	4.8	Nursing
69			10.0	3.4	11.6	4.2	10.4	3.6	Nursing
70	9.3	2.9					10.0	3.7	Nursing
71	9.4	3.1	10.2	2.5	9.7	3.8	10.2	4.1	Nursing
72	9.5	3.8	9.4	4.1	9.6	5.1	9.5	4.3	Nursing
73	10.8	3.6	10.3	3.0			10.5	3.4	Nursing (4 wk.)
74	10.1	2.6	11.0	3.5	10.6	4.2	11.0	3.6	Sup. feeding
75	9.8	3.2	9.0	2.7	10.0	4.1	10.0	4.2	Nursing
AV.	9.9	3.2	9.9	3.3	10.5	4.4	10.4	3.9	

the 4.4 mg. found two weeks postpartum is very close to the averages of 4.3 and 3.8 mg. for seven days, while the 3.9 and 3.8 mg. averages of Tables II and III at six weeks may be considered as the same. Individual variations are greater than with calcium, but on the whole the indications are that there is a high point at the time of delivery, followed by a fall of short duration, then a gradual rise to a level slightly higher than that of the latter part of the pregnancy.

TABLE III. POSTPARTUM SERUM CALCIUM AND INORGANIC PHOSPHORUS
ALL FIGURES ARE GIVEN IN MG. PER 100 C.C. OF SERUM

CASE	WEEKS POSTPARTUM	CA.	P	REMARKS
76	6	10.7	4.2	
77	7	11.2	4.1	Nursing
78	6	10.3	3.5	Nursing
79	6	9.8		Nursing
80	12	10.4	2.9	Nursing
81	6	10.7	4.4	Nursing
82	6	10.6	3.5	Nursing
83	8	10.5	3.5	Nursing
84	8	10.6	3.8	Nursing
85	6	10.7	2.7	Nursing
86	6	10.0	4.4	Baby died at 7 days
87	6	11.1	3.8	Nursing
88	6	9.9	3.5	Not nursing
89	6	9.4	3.4	Nursing
90	6	10.5	4.1	Stillborn baby
91	6	9.9	3.5	Not nursing
92	6	11.3	4.8	Nursing
93	4	10.3	3.8	Not nursing
94	6	10.0	4.0	Nursing
95	6	10.6	4.1	Nursing
96	6	10.2	4.2	Nursing
AV.		10.4	3.8	

SUMMARY

Data presented show that the serum of the fetus, as sampled from the umbilical cord, is higher in calcium and inorganic phosphorus than that of the mother at the time of delivery. This is in accord with the observations of previous investigators. In 36 cases the cord serum averages 11.7 mg. calcium. The average for the mother in 44 cases is found to be 9.8 mg. of calcium per 100 c.c. of serum at onset of labor, and no significant change is found at delivery or two days postpartum. The averages, however, for the seventh day postpartum, 10.3 mg. for 41 cases, and for the twelfth to fourteenth day, 10.5 mg. for 18 cases, indicate a gradual rise in calcium following delivery. At six weeks or more postpartum, 10.4 mg. per 100 c.c. was found to be the average of 52 cases, most of whom were nursing. Only eight were below 10.0 mg., the lowest being 9.4 mg. Since 10.4 mg. was also the average found for 60 normal

women it is suggested that the lower limit of the accepted normal range, 9.0 mg. per 100 c.c. may be too low.

The inorganic phosphorus averages indicate a slight rise during the latter stages of pregnancy, reaching a peak at delivery, 5.1 mg. in 35 cases, followed by a short decline, and a subsequent recovery to a little higher than the predelivery level. Three and seven-tenths mg. to 3.9 mg. was found to be the phosphorus average of the mothers, most of whom were nursing, at six weeks postpartum. The cord blood averaged 5.8 mg. inorganic phosphorus in 36 cases.

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2105 ADELBERT ROAD

Anselmino, K., and Hoffman, F.: Antiglycogen Substance (Thyroid Hormone) in the Blood of Pregnant Women. Arch. f. Gynäk. 143: 310, 1930.

The authors demonstrated a substance in the blood of pregnant women which has the power of decreasing the glycogen content of the liver of a mouse. This substance is present in the blood after the second month of pregnancy and gradually increases in amount throughout pregnancy. It is at its maximum concentration at the onset of labor, begins to decrease on the second day postpartum and has disappeared after the eighth day postpartum. It is present in the fetal blood stream as well but in much smaller amounts than are found in the maternal blood. This substance is identified as a thyroid gland hormone. Two and a half c.c. of blood from a pregnant woman will produce a decrease in the glycogen content of the mouse liver up to 75 per cent. This corresponds to the action of 40 to 50 units of thyroxin.

RALPH A. REIS.

COAGULABILITY OF THE BLOOD IN PREGNANCY

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AT THE present time there prevail opposing views regarding the coagulability of the blood in pregnancy and in the puerperium. This disagreement is brought about mainly by the fact that the simple determination of the coagulation time, the test usually employed as an index of the coagulability of the blood, is surrounded by inherent difficulties. The multiplicity of methods devised for the determination

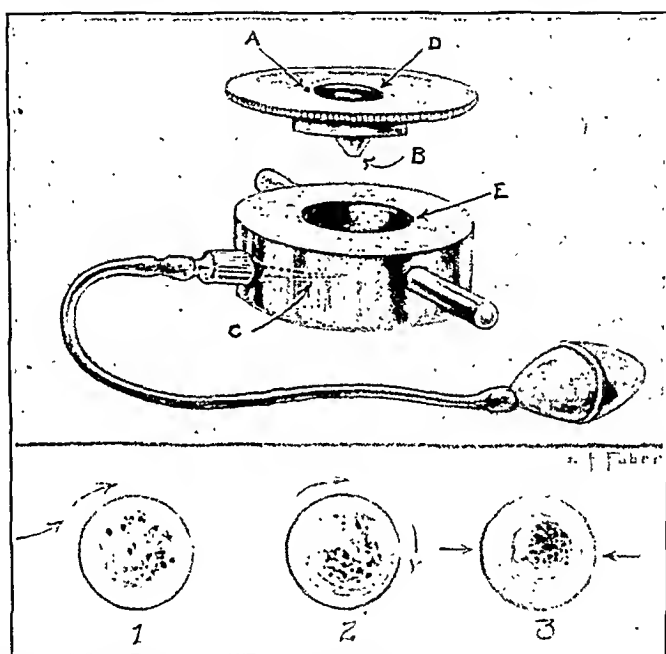


Fig. 1.—Bogg's coagulometer employed in determination of coagulation time. A, air vent allowing an equalization of pressure in the chamber (E) when air is blown in. B, glass cone. C, metal tube projecting into chamber. D, glass window.

of clotting time, and the variant results obtained by these methods, point to the uncertainty of the test in gauging the coagulating property of the blood. For this reason, it is practically impossible to satisfactorily compare and evaluate results reported by numerous observers for both normal and pathologic conditions.

The present study was conducted to determine the blood coagulation time in pregnancy and in the lying-in period, with the purpose to ascertain if this test could be depended upon to render reliable information regarding the coagulability of the blood. The instrument employed in this investigation was selected with especial care because of the shortcomings of some of the methods offered for the test. A method both accurate and simple in technic was desirable. For this reason the

Bogg's modification of the Brodie-Russell's instrument was chosen (Fig. 1), with the realization, however, that an infallible method has yet to be developed. One qualified technician performed all the tests in order to minimize as much as possible the error due to personal equation, which is claimed by Solis Cohen to be important in this method.

The literature on the subject leads to the conclusion that there is great difference of opinion concerning the degree of ability of the blood to coagulate in pregnancy. Several authors (Cohen, Hartman, Cristea) claim that the coagulability is unchanged in pregnancy, while numerous others have reported that there is a discernible shortening of the coagulation time during gestation, immediately after labor, and in the beginning of the puerperium.

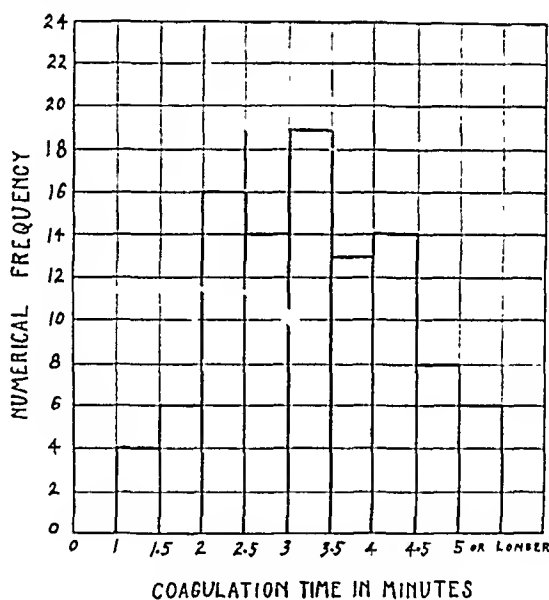


Fig. 2.—Histogram of grouped numerical frequencies of coagulation time in tests on 100 normal nonpregnant women.

In general, most of them report a shortening of the coagulation time in pregnancy, which returns to normal at the end of the puerperium.

TECHNIC

In the determination of the coagulation time by means of the Bogg's coagulometer, the progress of coagulation is directly observed in a drop of blood contained in a suitable moist chamber and set in rotation by a very fine stream of air tangentially directed at it. The coagulometer consists of a chamber (*E*, Fig. 1) into which a glass cone projects from above (*B*), terminating in a surface of 4 mm. in diameter. A metal tube (*C*) projects into the chamber from the side and ends in a tip close to the lower surface of the cone.

The test is performed as follows:

The cone (*B*) is touched at right angles to a large drop of blood from a free flowing puncture and not dipped into it. The time is noted with a stop watch. The cone is then promptly adjusted in the chamber, the instrument quickly placed upon

the stage of the microscope and the drop of blood is observed under the low power. A gentle blast of air is turned against the edge of the drop every thirty seconds by squeezing the bulb. This causes a rapid circular movement of the erythrocytes (1 and 2, Fig. 1). As soon as fibrin formation takes place, the independent movement of the single corpuscles ceases and they begin to move in larger masses. The progress of coagulation is tested from time to time with gentle currents of air until the radial elastic motion is observed, as of a rubber ball pressed in at one point. The coagulation time is counted from the moment the blood appears at the surface of the wound until this end-point is reached. Absolute cleanliness of the apparatus is essential to secure accurate results. Pressure upon the tissues or congestion of the part punctured will increase the coagulability of the blood and must be avoided.

The coagulation time of the blood was determined in 400 women registering at the antenatal clinic of the Jefferson Medical College Hospital, at various intervals in pregnancy. In 100 of these patients, additional tests were performed twenty-four to forty-eight hours after completion of labor, three to five days after delivery, and between the eighth and tenth day of the puerperium. To properly evaluate the results obtained in pregnancy, the clotting time was also estimated for 100 normal young nonpregnant women (Fig. 2). The shortest time observed was one minute, while the longest was seven minutes. It is readily noted that the coagulation time readings tend to center in duration somewhere in the neighborhood of two and five-tenths to four minutes inclusive (62 per cent). Only 36 per cent of the normal individuals gave clotting times, ranging between one and five-tenths and two and five-tenths minutes, while in 60 individuals (60 per cent) the clotting time was prolonged beyond two and five-tenths minutes. These results are in accord with those reported by Murphy and Gould, for the normal individual, who used the same type of coagulometer.

In recording the results of the test throughout this study, the following unalterable rule was followed:

A coagulation time with a fraction of a minute less than fifteen seconds was recorded with the time of the immediate lower figure. Accordingly, a coagulation reading of two minutes and twelve seconds was recorded as being two minutes, whereas a clotting time of two minutes and twenty-two seconds was listed as two and five-tenths minutes. Although differences in coagulation time of fifteen to thirty seconds are insignificant where there is a large time range for normal readings, it was believed that the results could be more satisfactorily and accurately compared if such minute changes were recorded.

It might be interesting here briefly to summarize (Table I) the various normal readings of coagulation time obtained and reported by different observers. From an analysis of these results one may be justified in concluding that an absolute normal clotting time does not exist. For a detailed description of the many methods and coagulometers devised for the estimation of the coagulating time, the reader is referred to the communication by Solis Cohen, from whose conclusive study the above figures have been abstracted.

TABLE I. NORMAL COAGULATION TIME OBTAINED WITH DIFFERENT METHODS

METHOD	TIME IN MINUTES
Vierodt's	9.5
Wright's	2.5 to 5
McGowan's	8
Addis' Modification of McGowan's	9.5
Brodie-Russell's	3 to 8
Bogg's Modification of Brodie-Russell's	3 to 8
Addis' Modification of Brodie-Russell's	8
Cohen's Modification of Milian's	8.66
Milian's	15 to 34
Morawitz's	5
Sabrazes'	9 to 10

OBSERVATIONS IN PREGNANCY

The test was performed on 49 women during the first four months of gestation, on 98 in the fifth and six months, on 187 in the seventh or eighth month, and on 66 in the last month. Of the 49 tests performed in the first four months of gestation, 33 or 67.3 per cent gave a coagulation time of one and five-tenths to two and five-tenths minutes (both figures are inclusive). A coagulation time of one and five-tenths to two and five-tenths minutes was also obtained in the other periods of pregnancy as follows: 72 or 73.4 per cent of the 98 patients examined in the fifth or sixth month, 134 or 71.1 per cent of the patients tested in the seventh or eighth month and, finally, 49 or 74.2 per cent of those examined in the last month. Of the total of 400 patients studied, 288 or 72 per cent had a coagulation time ranging between one and five-tenths and two and five-tenths minutes.

Fig. 3 portrays concisely in graphic form the coagulation time in numerical frequency of the 400 gravid patients studied. It is observed that the coagulation times tend to group themselves in duration in the region of one and five-tenths to two and five-tenths minutes. It is to be especially noted that coagulation was completed in 349 or 87.2 per cent of these patients at or before two and five-tenths minutes, whereas only in 51 or 12.8 per cent of them was the time extended beyond two and five-tenths minutes.

In order to gain a clearer conception of the difference in the results obtained in the nonpregnant and pregnant individuals, comparative polygon graphs have been constructed based on the arrangement of the coagulation time values according to percentage frequency (Fig. 4). From these graphs one may note that there were considerable higher percentages of the rapid coagulation rate estimations (one and five-tenths to three minutes) among the gravid group of patients than among the nonpregnant. Although the clotting time readings for the entire number of individuals examined (pregnant as well as nongravid) may be considered to fall within the so-called normal range limits

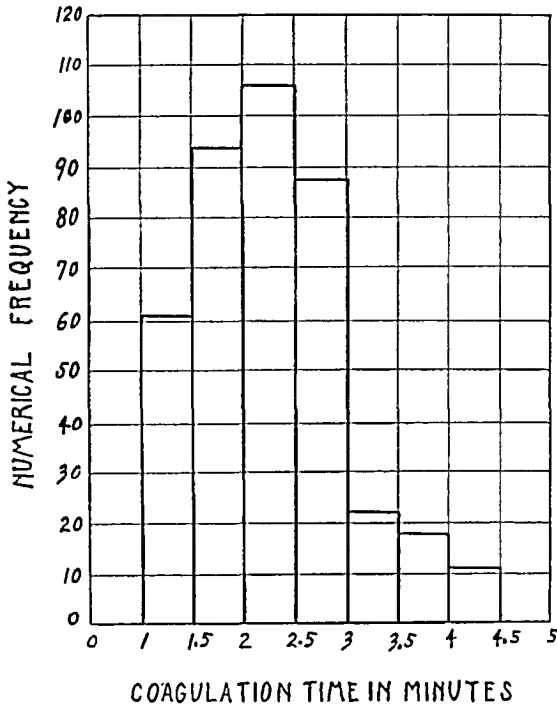


Fig. 3.—Histogram of grouped frequencies of coagulation time in 400 women in different periods of gestation.

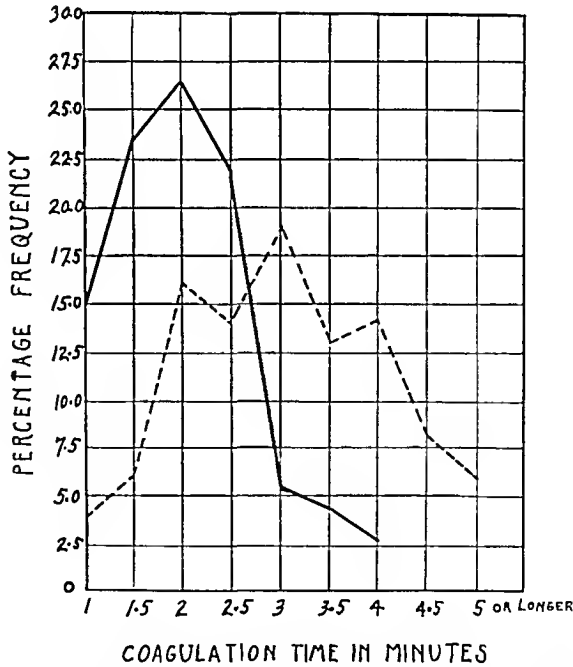


Fig. 4.—Comparative polygons of percentage frequency of coagulation time readings in (a) pregnant patients (solid line), and (b) normal nonpregnant individuals (broken line).

(there being no specific or fixed normal coagulation time), the results of the test suggest that there is an appreciable tendency of the blood to clot relatively more quickly in pregnancy than in the nongravid state.

The comparatively small differences in the clotting time in the two classes of women further suggests that the simple determination of the time required for a drop of blood to coagulate in vitro does not adequately represent the efficiency of the blood coagulating mechanism. It is, therefore, our belief that this ordinary test, in its present state of development, can not be relied upon to measure slight differences or changes in coagulability of the blood. Since the blood platelets and calcium salts, two of the necessary factors for proper coagulation, are not significantly altered in normal pregnancy, it seems that an estimation of the fibrinogen content, which is known to be definitely increased, would give more reliable information concerning the blood coagulability in this condition.

COAGULATION OF THE BLOOD POSTPARTUM

The coagulation tests of 100 individuals were performed within forty-eight hours, three to six days after childbirth, and again seven to ten days postpartum, in order to determine the immediate effect of parturition. Of the 100 patients studied in the puerperium, 76 per cent gave a clotting time of one and five-tenths to two and five-tenths minutes which corresponds in general with the findings of the aggregate number under study. In this limited group, the clotting time was one and five-tenths minutes in 26 patients, and two minutes in 35 patients. A large proportion of the conspicuously short coagulation times (one to two and five-tenths minutes) prior to delivery were distinctly lengthened in the lying-in period by at least fifteen seconds, while the primarily long clotting times remained the same, i. e., a change in time of less than fifteen seconds, or were, to a small degree, shortened. This slight, but positive, prolongation of the coagulating process would indicate a return of the values to those of the nonpregnant individual.

SUMMARY AND CONCLUSIONS

Tests for determinations of the coagulation time were performed on 100 nonpregnant women and on 400 gravid patients in the various periods of pregnancy. Additional tests were performed on 100 patients during the lying-in period.

It was found that only 36 per cent of 100 normal nongravid individuals gave a clotting time ranging between one and five-tenths and two and five-tenths minutes, whereas the coagulation was completed in 349 or 87.2 per cent of the 400 women examined in pregnancy before two and five-tenths minutes. On the basis of these results one may safely conclude that the coagulability of the blood (as shown by the test employed) is relatively increased in pregnancy.

Because of the small differences in the clotting time of the pregnant and nonpregnant individuals, it is the feeling of the authors that this test can not be relied upon to disclose the efficiency of the mechanism of coagulation.

The results of the test in the puerperal period show that there is a rather sharp tendency for the readings to return to the values found in the nongravid state.

The authors wish to acknowledge their appreciation to Miss Regina T. Hoban, who carefully performed all the determinations of coagulation time under the direct supervision of Doctor Baxter L. Crawford, Director of the Pathological Laboratory, Jefferson Medical College Hospital.

1621 SPRUCE STREET

1717 PINE STREET

THE LOWER SEGMENT CESAREAN SECTION, OR CELIOISTHOMOTOMY

A PRELIMINARY REPORT

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THE performance of the newer types of cesarean section, namely the low or cervical, hinges on the knowledge of the extent, the structure, and the physiologic characteristics of the lower segment of the uterus. Though Bandl,¹ Küstner,² Bayer,³ Bumm and Blumreich,⁴ et al., hold that the lower segment is derived from the cervix, on the other hand Ruge,⁵ Schroeder,⁶ Veit,⁷ Zweifel⁸ and other investigators have proved either by frozen sections or tissue examinations that, at least in the latter months of pregnancy and at the onset of labor, it is derived only in part (2 to 3 cm.) from the cervix, while the larger portion (6 to 8 cm.) is developed from the lower zone of the body of the uterus; furthermore, Hofmeier⁹ has demonstrated by histologic researches a close similarity of structure between the lower segment and the uterine body; likewise on an anatomical basis, Aschoff,^{10, 11} has shown that the lower segment corresponds to that part of the uterine body which he calls "isthmus uteri" and Schmidt¹² and Stieve,^{13, 14} have pointed out that from the third month of gestation on, the isthmus changes its tubular shape and becomes unfolded to form the lower pole of the uterine cavity. During labor the uterus becomes differentiated into two distinct portions, divided from each other by means of the Bandl's or contraction ring. The upper, thicker, and harder corresponds to the active, contractile portion; the lower, thinner, and softer corresponds to the passive, distended isthmus, with which the cervix, in the gradual process of effacement brought about particularly by the upward and outward retraction of its muscular and elastic fibers, has become fused, so to speak. In this manner, the fully developed isthmus is formed and in such condition its length varies between 6 to 9 cm.

As De Lee states, "One may deliver a fetus by an incision through it (the lower segment) without encroaching on the contractile or motor portion of the uterus."¹⁵ This statement, while it may obtain for a fetus having a small head, in our experience does not hold true for the average

full-term child. As a matter of fact, in performing the laparotrachelotomy, as described by Beck and De Lee, in several instances we met with some difficulty in extracting the child, through the conventional 10 cm. incision, so that often tears resulted in the upper contractile portion of the uterine body, with consequent increased bleeding, and lessened chance of sound healing of the incision. On the other hand, Williams, in describing the technic of the classic cesarean section, points out that an incision in the uterine body measuring 15 cm. is necessary.¹⁶

The same author in describing the vaginal cesarean section states that: "When one recalls that the suboccipitobregmatic circumference of the fully developed head measures 32 cm., if only an anterior incision is made, it must measure 15 to 16 cm. in length to permit the passage of the head, without laceration of its upper end, which would necessitate opening the peritoneal cavity."¹⁷

There is no reason why the same criteria should not hold true and particularly so, in the performance of the low cesarean section, inasmuch as the latter operation involves a zone of the uterus, which during labor becomes quite thin and prone to laceration. In the face of such difference of opinion, however, and with the purpose of solving the problem of the length of the incision required for the delivery of the head of the full-term child, we have resorted to the following scheme, in which we have tried to reproduce as closely as possible the conditions as met with in the actual operation: A square piece of rubber dam, in which a slit 10 cm. long had been made, was passed over the suboccipitobregmatic circumference of each head of 50 newborn babies, shortly after delivery. From this experiment, which included newborn delivered normally, or by forceps, or by version or section, one could readily see that if the suboccipitobregmatic circumference was between 30 and 31 cm., the original line of incision in the rubber dam would invariably tear to not less than 11 cm., while if the same circumference was between 31 and 32 cm., the incision would be extended to 11 or 12 cm., and so on, proportionately, reaching as high as 14 or 15 cm. in some cases in which the suboccipitobregmatic circumference measured over 34 cm. The average suboccipitobregmatic circumference in the 50 cases was 32.2 cm.; the average incision required was 12.1 cm.

In performing a low cesarean, a child presenting by the head is not always delivered in the plane of the suboccipitobregmatic diameter and this is by no means a constant quantity. It may vary according to the sex or the race of the fetus, or to the degree of compressibility of the head or to the stage of ossification of the sutures, or to the extent of the molding, etc., yet for practical purposes one has to admit that the suboccipitobregmatic being the smallest circumference of the fetal head, the length of the incision through which this may be delivered, without causing injury or trauma to the uterine or pelvic structures, should at least be adequate to the above circumference.

By means of a preoperative pelvicephalometric roentgenogram, following the method of Thoms,¹⁸ one might get the exact measurements of the fetal cephalic diameters, but in practice, at the actual operation, after opening the abdominal cavity, one may obtain a fairly accurate idea of the size of the head by palpation, through the thin wall of the lower segment, and with sufficient experience may judge the extent of the incision.

As shown above, the length of the lower uterine segment is rarely above 10 cm., and the minimum requirement for the passage of the average full-term fetal head is 12 cm.; therefore, it is obvious that the longitudinal incision is inadequate for delivery. This observation led to the introduction of the transverse incision, a method first suggested by Kehrer in 1881, later described by Kerr and Hendry,¹⁹ and followed by Hirst,²⁰ Stein and Deventhal,²¹ Phaneuf,²² et al. In the average case, however, a rectilinear transverse incision of 10 cm. is inadequate for the delivery of the child, for in such circumstances, it is unavoidably followed by injury to important blood vessels (especially the uterine) or

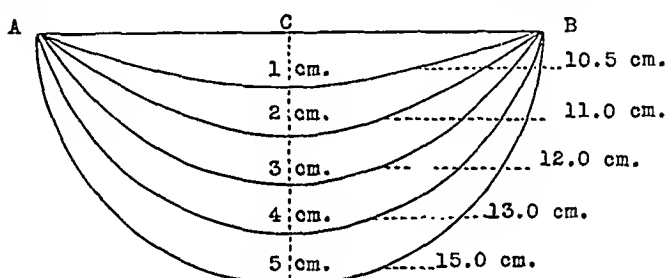


Fig. 1.—Diagram showing the proportionate increase in length of each arc in relation to its distance from the center of the cord.

even by laceration of the broad ligaments. Therefore, it has appeared to us that a transversely curved incision would be more satisfactory because it may be extended to 14 or 15 cm. without interfering with the contractile portion of the uterus or with important lateral structures. This is clearly shown by Fig. 1, in which, though the chord *AB* remains constant, 10 cm., yet, the different arcs starting from its terminal points *A* and *B* have a variable length, which is in direct proportion to the distance of their center from the midpoint *C* of the chord.

In as much as the field of the operation to be described is strictly confined within the limits of the isthmus, as defined above, it would seem proper to term the procedure "celioisthmotomy," or rather transverse celioisthmotomy in contradistinction to the longitudinal, provided the latter is also within the isthmus.

TECHNIC OF THE TRANSVERSE CELIOISTHOMOTOMY

The patient, prepared, catheterized and draped is anesthetized and placed in the Trendelenburg position. A longitudinal median abdominal incision about 15 cm. long is made from below the umbilicus to the symphysis pubis; the skin and subcutaneous tissues are retracted, the fascia divided some distance from the median line over the rectus muscle, which is either split longitudinally or retracted

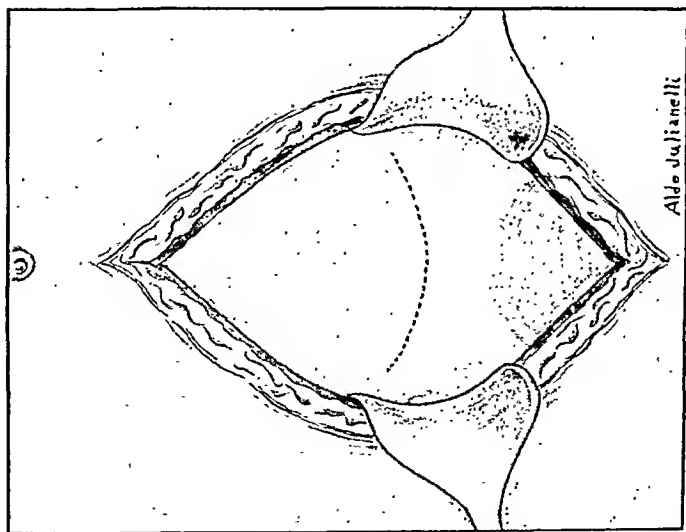


Fig. 2.—Intended line of incision in the loose peritoneum of the lower segment.

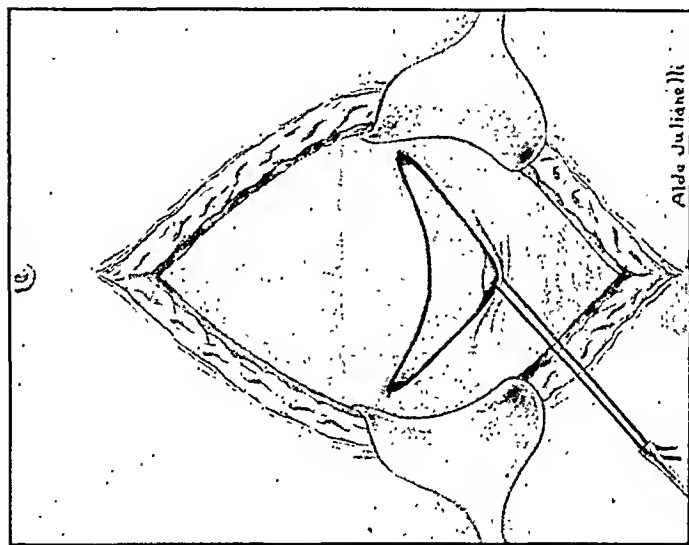


Fig. 3.—Transversely curved incision in the peritoneum of the lower segment.

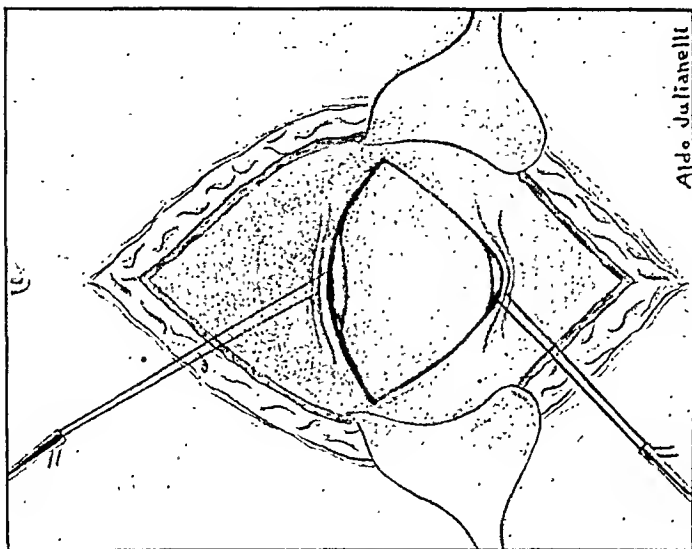


Fig. 4.—Two peritoneal flaps are raised and retracted by sutures.

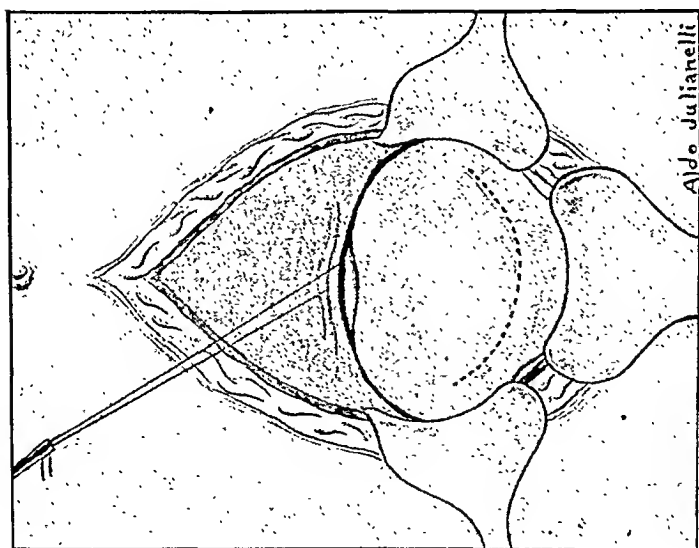


Fig. 5.—Intended line of incision in the lower segment.

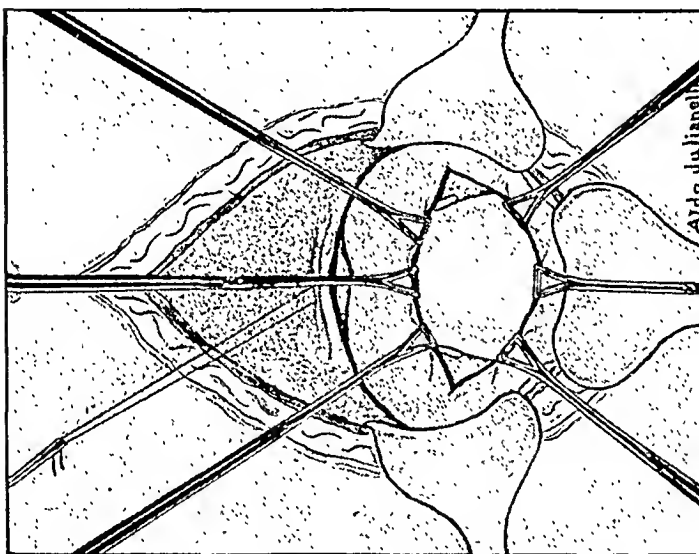


Fig. 6.—The incision in the lower segment completed and its edges caught with special clamps.

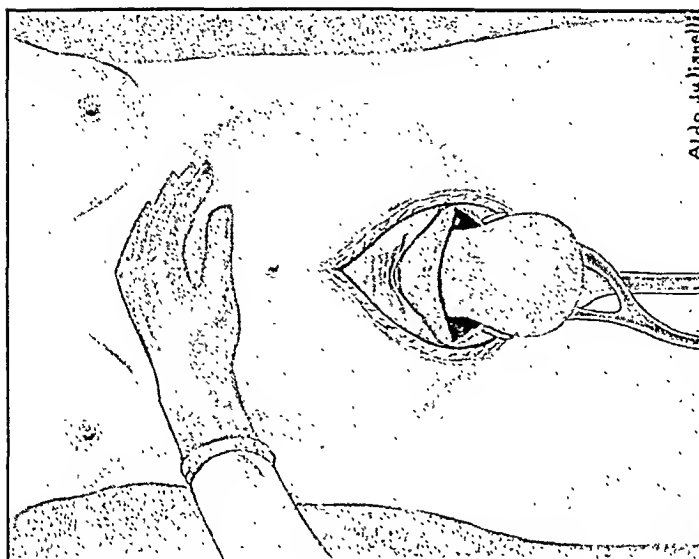


Fig. 7.—The child's head is delivered by pressure upon the fundus, over a single forceps blade used as a veetis.

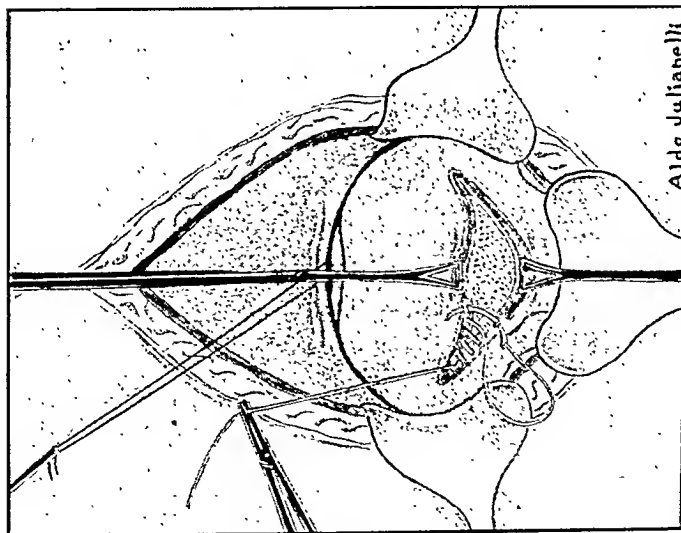


Fig. 8.—First row of sutures taking in the lower layer of myometrium.

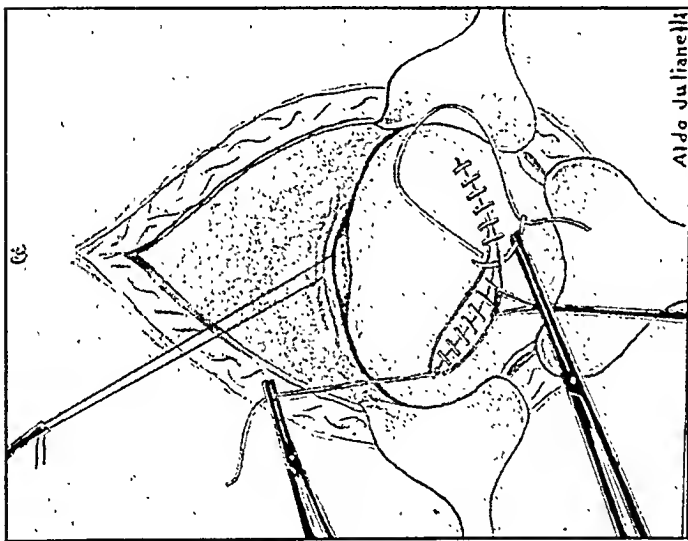


Fig. 9.—Second row of sutures taking in the upper layer of the myometrium and the fascia of the lower segment.

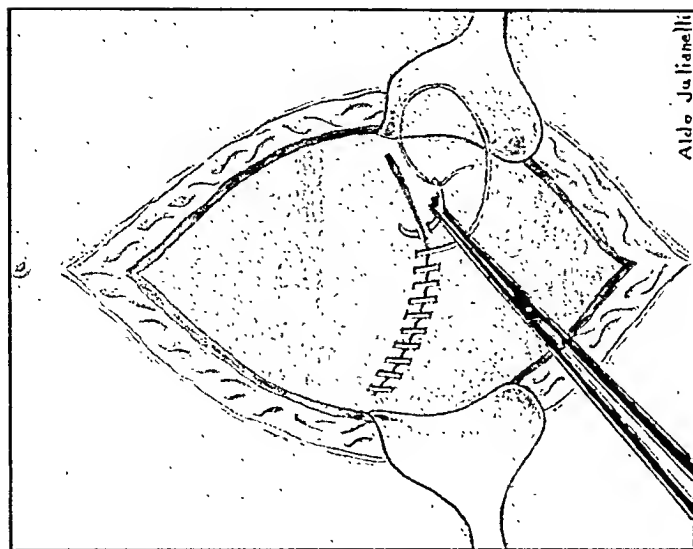


Fig. 10.—The edges of the peritoneum of the lower segment are directly united by a continuous suture.

outwards. The peritoneum is opened, special care being taken to avoid wounding the bladder, which is retracted over a protecting compress by a De Lee or Doyen retractor. The upper portion of the abdominal cavity is likewise packed off with laparotomy sponges, and two lateral retractors are slipped under the parietal peritoneum at both sides. A transversely curved incision, 12 to 15 cm. in length with the convexity downwards, is made through the loose uterine peritoneum, about midway between the "gray line," corresponding to the contraction ring, and vesical reflection, Figs. 2 and 3. By blunt dissection two peritoneal flaps are raised and their edges held out of the way by means of Allis forceps or preferably by traction sutures (Fig. 4). The bladder retractor is then placed over the lower flap, thus exposing the denuded lower uterine segment (Fig. 5). A transversely curved incision from 12 to 15 cm. long and with convexity downwards, is made in the lower uterine segment, starting at the center with a scalpel, and completing

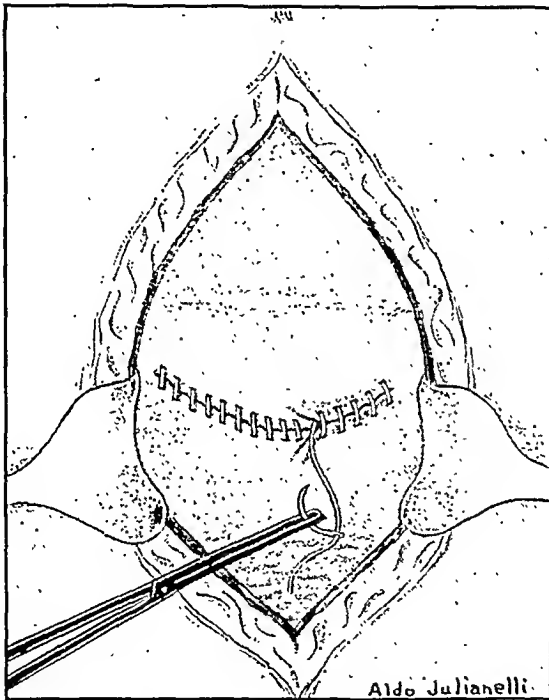


Fig. 11.—Additional row of continuous Lembert sutures, reinforcing the first line of sutures.

the incision on both sides with a pair of Mayo scissors. The edges of the incision are immediately caught with special triangular clamps, whose jaws grasp firmly but do not crush and devitalize the tissues (Fig. 6). As soon as the amniotic sac is opened, continuous aspiration of the fluid and blood is maintained by means of a suction apparatus. The baby's head is delivered by pressure on the fundus, over the palm of the hand, or a single forceps blade, used as an inclined plane (Fig. 7). In breech presentation the infant is extracted by the feet.

Immediately after the delivery of the child, 1 c.c. of pituitrin is administered to the mother by intramuscular injection. The placenta is allowed to separate spontaneously, unless there is some delay, when it is removed manually through the incision. In infected cases, however, if the cervix is known to be dilated sufficiently, the cord is dropped back into the uterus and placenta expressed by the Credé method through the vaginal canal, following the closure and peritonization of the incision.

The incision is closed with No. 2 chromic catgut continuous sutures, in two layers, the first including the lower layer of the muscular coat and at times the mucous membrane also, and the second taking in the upper layer of the myometrium and the fascia of the lower segment (Figs. 8 and 9).

In clean cases, the edges of the uterovesical peritoneum are united without flapping; in suspicious and unclean cases, however, we prefer to anchor the upper flap of the peritoneum to the lower segment with a few interrupted sutures and then raise the lower flap and suture it with a continuous No. 1 chromic catgut over the upper flap, in the manner described by Beck²³ and De Lee.²⁴ By thus covering the incision in the isthmus by means of the vesical peritoneal flap, the incision becomes sealed and leakage of infective material from the interior of the uterus to the peritoneal cavity is prevented. Moreover, in order to avoid adhesions to the lower segment we have preferred, lately, to unite the two peritoneal edges directly, reinforcing with an additional row of continuous Lembert sutures (Figs. 10 and 11). The abdomen is then closed in layers in the usual manner. In infected cases a rubber dam drain is placed under the skin, in the lower angle of the incision.

For the purpose of illustrating certain relevant features of both types of operation, a brief statistical review of twenty consecutive cases from our service, is given.

In chronologic order the cases were distributed as shown in Table I:

TABLE I. YEARLY INCIDENCE OF CELIOISTHOMOTOMIES

YEAR	1927	1928	1929	1930	1931
Longitudinal	3	4	3	3	1
Transverse	—	—	—	4	2

The indications are detailed in Table II.

TABLE II. INDICATIONS

	LONGITU- DINAL	TRANS- VERSE
Contracted pelvis, border line	6	—
Moderately contracted pelvis	4	2
Relatively contracted pelvis	—	1
Contracted pelvis, funnel type	1	—
Placenta previa centralis	1	—
High amputation of cervix	1	1
Congenital vaginal stenosis	—	1
Relatively contracted pelvis, repeated cesarean section	—	1
Vaginal atresia, septate vagina	1	—

All these cases had a long test of labor, except the case of longitudinal section done for high amputation of cervix and another, a cesarean section repeated for the fourth time, in the transverse series, both of which were performed in the beginning of labor.

Anesthetic.—Ether was used in ten cases (longitudinal), gas-oxygen and ether in seven cases (1 longitudinal, 6 transverse) and local infiltration with novocaine-adrenalin in three cases (longitudinal).

Mortality.—There was no mortality in either series. It is interesting

to note in this regard, that an excellent survey, recently made by Phaneuf,²⁵ shows a mortality of 5.6 per cent or nine maternal deaths in 160 cases, in which a longitudinal celioisthmotomy was performed, as against 3 per cent or six maternal deaths in 198 cases in which the transverse section was employed.

Morbidity.—The standard of morbidity varies with different institutions. We believe that a temperature ranging from 99.5° to 100° during the first two days postoperative, should be considered as a physiologic reaction following a celiotomy. Therefore, we have designated as *normal* those cases in which, during the first two days postoperative, the temperature does not exceed 100° by mouth; *mildly febrile* those cases in which the temperature ranges from 100° to 101°; *moderately febrile* when the temperature ranges from 101° to 103°; and *markedly febrile* when the temperature is above 103°.

Table III is based on the classification above:

TABLE III. RELATIVE MORBIDITY IN THE TWO TYPES OF CELIOISTHNOTOMY

		LONGITUDINAL TYPE	TRANSVERSE TYPE
Normal		6 cases or 43%	3 or 50%
Febrile	Mildly	1 case or 7%	3 or 50%
	Moderately	7 cases or 50%	
	Markedly	0	0

By summing up the figures for the febrile cases in the two groups, it is found that there is a percentage of 57 per cent in the longitudinal cases, as against 50 per cent in the transverse cases.

Though the patients in the transverse group were in poorer condition than in the longitudinal, due to membranes ruptured for a longer period of time, or to larger number of vaginal examinations at home, or to instrumental attempts at delivery, yet, none showed a marked degree of morbidity, and as a matter of fact, there was less morbidity than in the longitudinal group.

TABLE IV. CAUSES OF MORBIDITY IN CELIOISTHNOTOMY

	LONGITU- DINAL	TRANS- VERSE
1. Fat necrosis of lower angle of the wound	1	—
2. Long test of labor (aver. 39 hours)	3	—
3. Repeated vaginal examinations at home	3	1
4. Abscess of lower angle of incision and thrombophlebitis	—	1
5. Membranes ruptured for over 26 hrs. attempt at forceps extraction	—	1
6. Vaginal packing left in vagina for 12 hrs. in two cases of placenta previa centralis	1	—

We feel, however, that a comparative study of a larger series of celioisthmotomies is necessary before one may arrive at more definite conclusions about this often neglected phase.

COMMENTS

The celioisthmotomy is especially indicated in suspected or infected cases, in which labor has lasted many hours, the membranes ruptured, when questionable vaginal examinations and manual or instrumental manipulations have been done, when there is fever, and the amniotic fluid is malodorous. This has been shown by the studies of Beuttner,²⁵ Hauch,²⁷ Gaifami,²⁸ et al., and may be explained on the ground that the low uterine segment of a pregnant woman, as it has been demonstrated by Hofbauer,²⁹ is protected against infection by the presence, in the parametrium, of phagocytes (monoocytes and elasmatoocytes), whose number

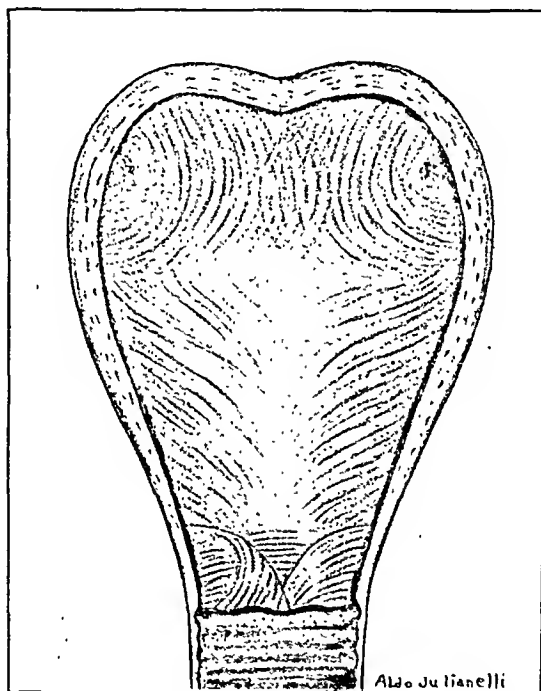


Fig. 12.—Dissection of uterine muscle, showing inner and outer layers of the isthmus. Adapted from Helie and Chenantais.

is increased by prolonged labor, and particularly by infection.* For this reason, in celioisthmotomy postoperative complications are much less frequent than after the classic section. As a matter of fact, peritonitis, gastric dilatation, and ileus are almost always absent. Adhesions are uncommon, and rupture of the scar, in a subsequent pregnancy or labor, a very rare occurrence. And an added advantage of isthmotomy is that it can be performed after a long test of labor, in cases of border line contracted pelvis.

In a recent survey of 874 cervical cesarean sections, Greenhill³⁰ stresses

*Nevertheless, we believe that in frankly infected cases, the Porro operation yields far better results than celioisthmotomy.

the fact that at the Chicago Lying-in Hospital, the laparotrachelotomy is the operation of choice when abdominal delivery is indicated. He refers particularly to the longitudinal type of low cesarean section inasmuch as there were only four cases in which the transverse method was employed. However, we feel that the latter method is preferable in the average case in which an incision of 12 cm. or more is necessary, whereas by employing the longitudinal method, a tear extending into the corporal portion of the uterus with consequent rupture of the circular sinus, at the junction of the upper and lower segments, would be unavoidable. The transverse crescentic incision in the lower uterine segment is also justified by the anatomical disposition of the muscle fibers (Fig. 12), as well as of the blood vessels (Fig. 13), whereby one may divide these tissues almost in

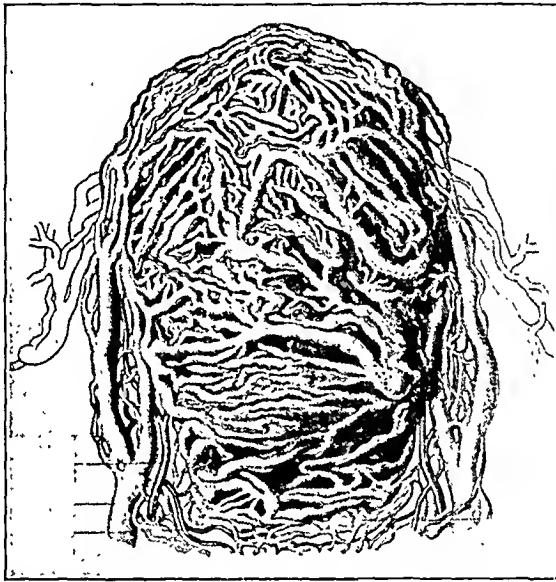


Fig. 13.—Pregnant Uterus with arteries and veins injected. (From C. Heitzmann, *Human Anatomy*.)

their line of cleavage, causing a minimum of trauma and hemorrhage. Furthermore, a close examination of Fig. 13 seems to disprove the opinion held by some operators that there is a median "avascular" zone of the uterus, which would permit an almost bloodless field in performing the longitudinal celiostomy. Other advantages of the method are: the incision is *always* within the quiet zone of the uterus, and is often more accessible for suture; the spill is limited to the lowest portion of the abdominal cavity and is easily controllable, the head is delivered more readily; the omentum and intestines are, as a rule, out of sight and practically never handled; there is less tendency to postoperative abdominal hernia, and as far as the literature shows, less risk of rupture of the scar in a subsequent pregnancy or labor.

SUMMARY AND CONCLUSIONS

1. Experimental and surgical evidence shows that an incision measuring 12 cm. or more is necessary for the delivery of the average full-term child's head.

2. A longitudinal incision in the lower segment is, therefore, inadequate, and a transverse curvilinear incision must be employed if one is to limit the operative field to the quiet zone. As this is represented by the isthmus, the term "celioisthmotomy" is suggested as being more appropriate.

3. A description of the operative technique is given in detail, though no originality is claimed; the transverse celioisthmotomy, as outlined above, seems to possess decided anatomic, physiologic, and technical advantages over the longitudinal.

4. A brief review of 14 longitudinal and 6 transverse celioisthmotomies is given for the purpose of comparing certain relevant features. The mortality was nil in both groups, whereas, the morbidity was 57 per cent in the longitudinal group as against 50 per cent in the transverse, in spite of the larger number of poor risks in the latter.

5. A critical study of larger series of celioisthmotomies, laying stress particularly upon the "morbidity" phase, is necessary, before one may arrive at more definite conclusions about the relative merits of both types of operation.

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MALIGNANT OVARIAN NEOPLASMS*

WITH A REPORT OF THE END-RESULTS IN A SERIES OF 93 CASES

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THE present study is a brief review of all cases of malignant disease of the ovary which have been observed in the Department of Obstetrics and Gynecology of the Hospital of the University of Pennsylvania. From a former survey¹ of the Hospital records it was found that ovarian neoplasms constituted 7.7 per cent of all gynecologic lesions. Fourteen per cent of all newgrowths of the ovary were malignant. Clinical and pathologic records of 125 patients, operated upon in the Department form the basis for the study. These are supplemented by records of 28 tumors removed at other clinics, which were sent to the Departmental laboratory for diagnosis.

The results of the treatment of 93 patients, traced for three years or longer, are recorded.

MORTALITY

All patients were treated by operation. The operative mortality in the group of 125 patients, based upon all deaths from any cause, which occurred within thirty days of operation, was 13 (10.4 per cent). This group includes a number of exploratory sections. Not infrequently a patient is brought to the hospital suffering from an intraperitoneal tumor and an enormous amount of ascites. In the treatment of these patients, it has been our policy to make a small abdominal incision, often under local anesthesia, which permits evacuation of the ascitic fluid and results in the making of a positive diagnosis. If necessary, a small portion of the tumor is removed for a frozen section diagnosis. We have had a number of cases of this type which, prior to operation, were thought to be malignant, but which proved to be benign and were saved by removal of the tumor. In many, however, the preoperative diagnosis of advanced malignancy was confirmed, and although only a small incision was made and biopsy performed, they subsequently died, not as a result of operation, but from the progress of the disease, which was in a lethal stage at the time of operation. Many of these cases go to swell the operative mortality. These patients and others, who died of nonoperative conditions within thirty days of operation, constitute a considerable proportion of the operative deaths. If these deaths were excluded, the operative mortality would be greatly reduced. The actual operative mortality in ordinary cases is approximately 2 to 3 per cent.

*Read before the Philadelphia Obstetrical Society, October 1, 1931.

END-RESULTS

Of the 93 patients forming the basis for the end-result study, 50 or 53.8 per cent are known to be alive three or more years after operation. Of the 43 deaths, 29 patients died of recurrences of the malignant condition, and in the remaining 14, the cause of death was either from an intercurrent disease or unknown. The 43 deaths include all operative deaths in the entire series of 125 patients concerning whom any clinical information was available. As this analysis includes all operative deaths in the entire series of 125 cases, and the ultimate salvage is based upon the 93 traced cases, the proportion of three-year cures is somewhat greater than the figure 53.8 per cent would indicate. Most of the recurrences were pelvic in situation, the first symptom often being the development of ascites.

PATHOLOGIC STUDY

All tumors were submitted to histologic examination and for the purpose of study may be grouped as follows:

TABLE I. CLASSIFICATION OF TUMORS

	NUMBER	PER CENT
Specimens	153	100
Glandular carcinomas	90	58.8
Papillary carcinomas	54	35.2
Sarcomas	9	6.0

The glandular type was nearly twice as frequent as the papillary.

TABLE II. BILATERAL INVOLVEMENT ACCORDING TO TYPE OF TUMOR

TYPE OF TUMOR	NUMBER OF CASES	PER CENT BILATERAL
Glandular carcinomas	90	35.5
Papillary carcinomas	54	31.4
Sarcomas	9	22.2

All types exhibited bilateral involvement. There were 51 bilateral malignant tumors (34.2 per cent) of 149 records of malignant tumors. Of the 153 specimens studied, 4 were from patients who were operated upon a second time for recurrence.

FACTORS INFLUENCING END-RESULTS

There was a significant difference in the three year mortality rate according to the type of the tumor.

TABLE III. MORTALITY ACCORDING TO TYPE OF TUMOR*

TYPE OF TUMOR	NUMBER OF PATIENTS	PER CENT 3 YEAR MORTALITY
Glandular carcinomas	40	57.5
Papillary carcinomas	35	14.2
Sarcomas	5	40.0

*Excluding 13 deaths during first month after operation.

Table III shows the glandular carcinoma group, 42.5 per cent of the patients survived for three or more years, whereas, in the papillary group, the salvage over a like period was 85.8 per cent, or practically twice as great.

The relative three year mortality rate of patients having unilateral ovarian involvement, contrasted with those exhibiting bilateral ovarian malignant tumors, is of interest.

TABLE IV. RELATIVE MORTALITY. UNILATERAL VS. BILATERAL TUMORS

	NUMBER OF PATIENTS	PER CENT 3 YEAR MORTALITY
Unilateral tumors	56	35.7
Bilateral tumors	24	41.6

The high incidence of bilateral involvement in the present series of cases, and its apparent relation to the proportion of three year salvages, raises questions of pathologic and clinical interest.

When only one ovary at the time of operation appears grossly malignant, may the other ovary also be microscopically malignant, but not grossly so? In 40 cases both ovaries were removed. In 33 of these cases both were microscopically and macroscopically malignant. The second ovary in 7 instances, however, though grossly benign in appearance, was microscopically malignant. It is apparent, therefore, that in these 7 cases (17.5 per cent) of the 40 under discussion, the macroscopic examination of the second ovary was insufficient for a complete diagnosis.

The influence of the extent of the operative procedure upon the proportion of three year salvage was also investigated. In 44 cases in which unilateral oophorectomy was performed, the three year salvage amounted to 34.1 per cent; whereas in 28 cases in which bilateral removal was carried out, the salvage for a similar length of time was increased to 53.5 per cent. The advantage of the more extensive operation, from this comparison is evident. This observation and the preceding one, dealing with the incidence of microscopic malignancy where the organ is grossly normal, demonstrate the advisability of performing bilateral oophorectomy in all cases.

A factor influencing the relatively high proportion of cases in which unilateral oophorectomy was performed was due in many instances to the fact that the malignant character of the tumor was recognized only upon histologic examination. This raises the important question of what should be the subsequent treatment of such a case. Distasteful as it may be to both patient and surgeon, our study would indicate a second operation is advisable in most cases. The mortality from a second operation will be not more than 2 or 3 per cent, whereas our figures indicate an increased salvage by such procedure of 53.5 as against 34.1 per cent, a definite gain, even after subtracting a probable 3 per cent mortality.

Viewed from another standpoint our study shows that 17.5 per cent of the 40 macroscopically benign ovaries, associated with malignant neoplasms of the opposite organ, were histologically malignant. Prophylaxis, however, is better than cure, and this study emphasizes the necessity of carefully examining at the operating table both ovaries of patients in which unilateral oophorectomy is considered, and in many cases employing the frozen section method before closing the abdomen.

One feature of the study was the finding of a large number of uteri (14) exhibiting malignant invasion of the corpus. (Table V.) There was a significant relation between this complication and the three year mortality. Of 82 patients without uterine involvement, the three year mortality was 43.8 per cent; whereas, in 11 cases with involvement, the rate was 63.6 per cent, a percentage difference of 19.8. The number of patients with uterine involvement on the other hand was, for statistical purposes, rather small.

TABLE V. THREE YEAR MORTALITY OF PATIENTS WITH ASSOCIATED UTERINE CARCINOMA

	NUMBER OF PATIENTS	PER CENT 3 YEAR MORTALITY
Without uterine carcinoma	82	43.8
Associated uterine carcinoma	11	63.6

The relation of the gross appearance of the malignant ovary to the three year mortality was investigated. Table VI suggests the influence which the presence of adhesions may bear to ultimate salvage.

TABLE VI. RELATION OF OVARIAN ADHESIONS TO END-RESULTS

	NUMBER OF PATIENTS	PER CENT 3 YEAR SALVAGE
No adhesions	15	80.0
Adhesions present	32	56.2

From a glance it will be seen that there is a percentage difference of 23.8 between the two groups. This difference is large enough to be significant.

SUMMARY AND CONCLUSIONS

1. Observations upon 153 malignant ovarian neoplasms, in 125 operated patients, and upon 93 of the latter which were kept under observation for three years or more are recorded.

2. Of 125 patients, 13 (10.4 per cent) died within thirty days of operation.

3. Of 93 patients traced for three years or more, 50 or 53.8 per cent, were apparently cured.

4. In the entire series of 153 specimens, the glandular type of ovarian carcinoma was nearly twice as frequent as the papillary type.

5. In our group of 80 follow-up patients, not including 13 who died within one month of operation, the glandular type was four times as malignant as the papillary type and the latter less malignant than the sarcomas.

6. Thirty-four and two-tenths per cent of 149 malignant tumors were bilateral. The difference between 149 and 153 specimens (Conclusion, 1) is accounted for by 2 operations on each of four patients.

7. All types of tumor had approximately the same tendency toward bilateral involvement.

8. In 80 cases, bilateral involvement, regardless of type, showed a higher three year mortality than the unilateral type.

9. When one ovary was *grossly* malignant at the time of operation (40 cases), the other ovary was found to be grossly benign, but *histologically* malignant in 17.5 per cent.

10. The percentage of three year salvage is higher following bilateral than after unilateral oophorectomy, in the proportion of 53.5 per cent to 34.1 per cent.

11. Uterine involvement of the corpus is a relatively frequent accompaniment of ovarian carcinoma; patients exhibiting this complication present an increased three year mortality. This further emphasizes the importance of a radical operation.

12. Patients with malignant ovaries, the seat of surface adhesions, removed at operation, exhibit a higher three year mortality than do those which present a smooth surface at this time.

13. Even advanced cases should receive the benefit of an exploratory section. This may be performed under local anesthesia. It permits relief of ascites, and histologic confirmation of diagnosis. By this policy occasionally supposed malignant conditions are found to be benign and such patients may be saved by an appropriate operation.

14. Bilateral oophorectomy and removal of the uterus should be the operation of choice, even though the second ovary appears to be grossly benign.

15. At the operating table all macroscopically benign ovarian tumors should be carefully examined. If necessary, when a unilateral oophorectomy is contemplated, a frozen section should be made, and everything possible should be done to exclude malignancy, before the abdomen is closed, and if malignancy is found, hysterectomy and a bilateral oophorectomy is the operation of choice.

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END-RESULTS OF RADIUM THERAPY IN CARCINOMA OF THE CERVIX*

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THIS report summarizes the end-results obtained by radium therapy in 475 cases of carcinoma of the cervix admitted to the Gynecological Service of the Hospital of the University of Pennsylvania from 1913 to July 1, 1926. Follow-up data were obtained in 89.15 per cent.

TABLE I. CASES OF CARCINOMA OF THE CERVIX, JANUARY, 1913, TO JULY, 1926

	NUMBER	PER CENT
Total number of patients	479	
Patients treated with radium	475	99.16
Patients seen but not treated*	4	0.83
Patients traced	427	89.15

*Three cases too extensive for treatment.
One patient refused radium treatment.

During the first few years covered by this report, all operable cases were treated by panhysterectomy, and radium was used only in the more advanced stages. This fact accounts in part, at least, for a somewhat lower percentage of favorable five-year end-results than have been recently reported by clinics in which radium has been used to the exclusion of operation. During the past eleven years, only one patient with carcinoma of the cervix has been operated upon; the remainder have been treated exclusively by radiation.

In grouping the cases we have followed the classification proposed by Schmitz. As shown in Table II, over four-fifths of the cases were in the so-called inoperable group and in only one-fifth was the disease either definitely or questionably limited to the cervix.

TABLE II. CLASSIFICATION BASED ON EXTENT OF DISEASE

	NUMBER	PER CENT
Total patients seen	479	
Early Lesions	92	19.20
Stage I	58	12.10
Stage II	34	7.09
Advanced Lesions	387	80.80
Stage III	244	50.93
Stage IV	63	13.15
Stage V	52	10.85
Extent not stated	28	5.84

Three patients died shortly after treatment, giving a primary mortality of 0.63 per cent.

*Read at a meeting of the Obstetrical Society of Philadelphia, October 1, 1931.

TABLE III. PRIMARY MORTALITY IN RADIUM CASES

	NUMBER	PER CENT
Total patients treated with radium (Either radium alone or cautery and radium)	475	
Primary Mortality	3	0.63
<i>Deaths:</i>		
Case 12936. Stage I. Cautery amputation and radium, 2400 mg. hr. Died of pulmonary embolism on sixth day.		
Case 8599. Stage III. Radium, 2400 mg. hr. Died of septicemia on fourteenth day.		
Case 11293. Stage III. Radium, 1640 mg. hr. Died of pelvic peritonitis on twenty-seventh day.		

The five-year end-results for the entire series are shown in Table IV. The classification of untraced cases is controversial, but in this report we have included them among those who died of carcinoma. Eleven patients who lived five years or more but who eventually died of the disease are, of course, not included in our percentage of five-year cures. Sixty-

TABLE IV. FIVE-YEAR END-RESULTS IN PATIENTS TREATED WITH RADIUM

Total patients applying for treatment	479
Total patients treated	475
Total patients living 5 or more years	73
Absolute 5-year cure rate	15.24%
Relative 5-year cure rate	15.36%

seven patients are living and apparently cured at the time of this report (October 1, 1931). Six additional patients who lived five or more years but who died of some condition other than carcinoma are counted as five-year cures. Following is a brief résumé of these cases:

1. Case 4899. Lived seven years after treatment. Her physician reported that there was no trace of carcinoma at the time of her death. Died at age of sixty-three.
2. Case 14372. Stage II. Lived five years after treatment. Died of heart disease at age of sixty-seven.
3. Case 6353. Stage III. Lived five years after treatment. Died of intestinal obstruction at age of seventy-five. Her physician reported that there was "no trace of carcinoma after treatment."
4. Case 9518. Stage III. Lived ten years after treatment. On last examination, Dr. Clark found her "a complete seven-year cure." Died at age of sixty-two.
5. Case 6592. Stage III. Lived thirteen years after treatment. Died of heart disease at age of sixty-seven.
6. Case 8628. Stage V. Lived six years after treatment. Died of "stroke" at age of sixty.

The results obtained in the various stages of the disease are given in Tables V and VI. This shows that in Stages I and II, which form the so-called operable group, cure has resulted in approximately one out of three; in 387 definitely inoperable cases the salvage has been about one out of ten.

Contrary to the opinion of others we believe that high amputation of the cervix with the cautery or radio-knife and the immediate application of radium are advantageous in the treatment of early carcinoma of the cervix. This may be attended by increased morbidity as well as mor-

TABLE V. FIVE-YEAR END-RESULTS ACCORDING TO DEGREE OF EXTENSION

STAGE	TOTAL NO. PATIENTS	PATIENTS TREATED	PATIENTS LIVING 5 OR MORE YEARS	ABSOLUTE CURE RATE	RELATIVE CURE RATE
I	58	58	23	39.65%	39.65%
II	34	34	7	20.58%	20.58%
III	244	243	32	13.11%	13.16%
IV	63	60	3	4.76%	5.00%
V	52	52	6	11.53%	11.53%
Not stated	28	28	2	7.14%	7.14%

TABLE VI. FIVE-YEAR END-RESULTS ACCORDING TO OPERABILITY IN PATIENTS TREATED WITH RADIUM

	NO. PATIENTS	NUMBER LIVING	ABSOLUTE 5-YEAR CURE RATE
Operable cases	479	73	15.24%
(Stages I and II)	92	30	32.60%
Inoperable cases	387	43	11.14%

tality, and, theoretically, it may be justly criticized on the ground that dissemination of the disease is favored, but the fact that approximately 53 per cent of our Stage I cases treated by this method were cured argues strongly in its favor.

TABLE VII. FIVE-YEAR END-RESULTS IN STAGE I CASES TREATED BY AMPUTATION AND RADIUM

Number Stage I cases so treated	34
Number patients living 5 or more years	18 or 52.94%

In his papers on the subject, Dr. Clark repeatedly expressed the belief that the chief benefit is derived from the initial radium treatment but he advocated reradiation on the appearance of active disease, and this plan has been followed by those of us who were associated with him.

During the earlier years covered by this report the routine treatment consisted of 2400 mg. hr. of radium followed by a similar dosage in six weeks. During the past few years the second routine application has been omitted. One hundred milligrams of radium has been used, filtered by 1 mm. of silver or 2 mm. of brass and soft rubber tubing. Re-radiation has been employed only in those patients showing evidence of continued growth. While in properly selected cases reradiation is undoubtedly of value as a palliative measure, Table VIII shows that it has not increased the percentage of cures.

Table IX shows the number of patients living beyond the five-year period and the absolute cure rate for each yearly series from five to eighteen years after treatment.

TABLE VIII. END-RESULTS ACCORDING TO NUMBER OF RADIUM TREATMENTS

NUMBER OF TREATMENTS	PATIENTS TREATED	NO. LIVING 5 OR MORE YEARS	PER CENT LIVING 5 OR MORE YEARS
One treatment	270	45	16.66%
Two treatments	167	25	14.97%
Three treatments	34	3	8.82%
Four treatments	2	0	
Five treatments	2	0	
Total	475	73	15.36%

TABLE IX. END-RESULTS OF CASES BEYOND FIVE YEARS, RADIUM GROUP
(479 CASES)

INTERVAL SINCE TREATMENT	CASES SEEN	PATIENTS LIVING 5 OR MORE YEARS	ABSOLUTE PER CENT 5-YEAR CURES
5 year	479	73	15.24%
6 year	457	64	14. %
7 year	411	56	13.62%
8 year	381	47	12.33%
9 year	337	40	11.86%
10 year	304	34	11.18%
11 year	263	31	11.78%
12 year	211	24	11.37%
13 year	156	19	12.17%
14 year	119	15	13.02%
15 year	78	12	15.38%
16 year	28	3	10.71%
17 year	11	3	27.27%
18 year	2	2	100. %

The biopsy material from 168 patients who were treated five or more years ago has been graded according to the classification of Martzloff. The selection of cases for this study has been impartial, as the only criterion was well preserved tissue for histologic study. Table X shows the results obtained in each of the histologic types.

TABLE X. END-RESULTS ACCORDING TO HISTOLOGIC TYPE

HISTOLOGIC TYPE (MARTZLOFF)	TOTAL NUMBER	NUMBER LIVING 5 OR MORE YEARS	PER CENT 5-YEAR CURES
Spindle cell	23	3	13.05
Transitional cell	30	8	26.66
Prickle cell	87	16	18.39
Adenocarcinoma	28	5	17.85

The striking feature of this analysis is the low curability rate in the spindle cell type which is recognized as being highly radiosensitive. This would seem to indicate that, so far as cure is concerned, its high degree of malignancy is of greater prognostic import than its radiosensitivity. The best results were obtained in the transitional cell group, which may be explained by its decreased malignancy as compared to the spindle cell type and its lessened radioresistance as compared to the prickle and adenoma types. Also of interest is the fact that the results obtained in adenocarcinomas were practically the same as those in the epidermoid group.

The evaluation of any treatment for carcinoma of the cervix must be based on the total salvage; by this we mean the number of cases cured as compared to the total number presenting themselves for treatment. The above report summarizes the results obtained in the John G. Clark Clinic since radium treatment was instituted eighteen years ago and includes all cases so treated from 1913 to 1926. The total salvage for the entire series has been 15.24 per cent.

During the first half of this period, however, radium was used only in the more advanced lesions and the curability for this period was 11.37 per cent. From 1920 to 1926 both early and late cases received radium treatment, with a salvage of 18.28 per cent. This compares favorably with the results reported from other clinics and confirms Healy's statement that, irrespective of the type of treatment used, the total salvage in any large series of cases will be in the neighborhood of 20 per cent.

Comparison of our results in Stages I and II with those from other clinics shows that our percentage of five-year cures is low and this may be due, in large part, to the fact that this clinic has advocated rather small radium dosage.

In this series of cases only five have received deep x-ray therapy in addition to radium. More recently we have subjected a number of patients to x-ray therapy and thus far our experience has been disappointing. However, the reports from other clinics unquestionably show its value as a palliative measure and encourage the hope that by its use in conjunction with radium the percentage of cures will be increased.

133 SOUTH THIRTY-SIXTH STREET.
1907 SPRUCE STREET.

(For discussion, see page 912)

Deilmann: Blood Typing in Mothers and Their Newborn. *Ztschr. f. Geburtsh. u. Gynäk.* 96: 102, 1929.

Deilmann typed the maternal and cord blood of 150 women and their newborn children. He found no defective types in the mothers and no variations from the Bernstein rule among the children.

LESTER E. FRANKENTHAL, JR.

Nishizaki, S.: Skin Pigmentation During Pregnancy. Its Significance for Parturition. *Japanese J. Obst. & Gynec.* 12: 390, 1929.

Nishizaki studied the skin pigmentation of 497 women in labor and found that those with intense skin pigmentation whether primiparas or multiparas often have shorter labors than other women. Likewise those with marked pigmentation less frequently have weak pains or require aid during delivery. They have less hemorrhage than women with little pigmentation and also fewer perineal lacerations. These facts indicate that women with intensive pigmentation are better prepared for labor than women with only slight pigmentation.

J. P. GREENHILL.

THE SPECIFIC GRAVITY OF THE BLOOD IN PREGNANCY AND IN THE PUERPERIUM*

A STUDY OF SEVENTY-FIVE PATIENTS

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THE following is a study of the anemia of pregnancy and of the puerperium in terms of the specific gravity of the blood. The falling drop technic of Barbour and Hamilton¹ was used as follows: "A drop of blood of definite size is released below the surface of a nonmiscible mixture. Its rate of fall depends on its density, which can be easily calculated as soon as the rate of fall of a similar drop of standard solution of known density (released under identical conditions) is available for comparison." I have employed this technic in various studies^{2,3} during the past five years, and I am convinced that it is a delicately accurate method of practical clinical value.

Search of the literature as far back as 1890 fails to reveal any work done on the specific gravity of the blood in pregnancy nor in the puerperium.

The average normal specific gravity of the blood in females in the afternoon is 1.053 (Schmaltz,⁴ Lyonnet,⁵ Leake, Kohl, and Stebbins,⁶ Polowe²). The present study is based on observations made between two and four o'clock in the afternoon. To make the tables more comprehensible, only the last two figures of the specific gravity values are used; thus a reading of 1.053 is represented by the figure 53.

Table I exhibits the findings in 75 patients. Fifty-two patients were observed during pregnancy, 40 patients in the puerperium (first ten days only), while 17 patients were followed through pregnancy and the puerperium. A total of 172 observations were made over a period of fifteen months, at one to four week intervals.

(a) *Pregnancy (52 Patients, 99 Observations).*—Experience has taught me that a specific gravity of the blood below 1.050 represents an anemic condition. If this figure is accepted as the lower limit of normal blood density, we find that 66 per cent of the observations made in the first trimester exhibit the anemia of pregnancy, 70 per cent in the second trimester, and 83 per cent in the third trimester.

Sixty-nine per cent exhibit the anemia of pregnancy in the first six months, while 79 per cent of the observations for the whole nine months of gestation represents definite grades of anemia.

The seventh month of gestation stands out as the month in which 100 per cent of the observations registers some grade of anemia.

(b) *The Puerperium (40 Patients, 73 Observations).*—There is no striking change in the specific gravity of the blood in the puerperium over that of pregnancy. If anything, the anemia is more marked and is present in a greater percentage (85 per cent) of the observations than during pregnancy.

*This work has been aided by a grant from the Committee on Scientific Research of the American Medical Association.

TABLE I. THE SPECIFIC GRAVITY OF THE BLOOD IN PREGNANCY AND IN THE PUERPERIUM

MONTH OF GESTATION								DAYS POSTPARTUM									
2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	10
48	43	45	41	39	33	33	32	38	34	31	38	36	40	49	31	40	32
	44	47	47	40	41	38	37	43	40	37	43	46	40	50	39	43	36
	47	48	48	42	41	38	41	44	43	43	44		43	52	40	43	44
	51	50	48	44	42	42	41	46	43	45	45		43		43	44	47
	52	50	51	45	42	43	42	49	43	47	49		44		44	45	53
		53	52	46	43	43	42	50	44	47	52		45		44	45	
				48	44	44	43		46	48			46		50	46	
				49	45	46	43		46	49			47			46	
				49	45	46	44		48	49			48			48	
				51	45	47	44		49				48			49	
				52	47	47	44		50				52			52	
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Table II (17 patients, 31 observations in pregnancy, 22 observations in the puerperium) is presented so that it may be seen that the findings therein approximate closely the independent observations shown in Table I. No comment seems necessary.

In Table III (12 patients, 16 per cent of the total number observed who had a specific gravity of the blood below 1.040 at one time or another during pregnancy or during the puerperium) only 3 patients (25 per cent) had uneventful courses. In 3 cases (25 per cent) notations appear upon the histories that spontaneous lacerations had occurred, episiotomy, the application of forceps, or combinations of these. Six patients (50 per cent) of this series of low blood densities, proved to be decidedly pathologic on the part of the mother, the fetus, or both.

COMMENT

Any discussion of the specific gravity of the blood presupposes the idea that a change in the blood is at once manifested by a change in its specific gravity. Such a change may be brought about by an alteration in the number of erythrocytes, leucocytes, platelets; by alteration of the

TABLE II. THE SPECIFIC GRAVITY OF THE BLOOD IN 17 PATIENTS WHO WERE FOLLOWED THROUGH PREGNANCY AND THROUGH THE PUERPERIUM

PT.	OBSERVATION	MO. GEST.	DAYS POSTPARTUM	SP. GR. BLOOD
1	11	7		1.047
	26	7½		43
	22		3	47
	26		10	47
2	64	8		45
	61		4	52
3	63	9		44
	57		3	45
4	22	8		47
	37	9		52
	18		7	52
5	15	7		47
	34	8		43
	15		4	43
6	48	7		48
	55	8		47
	36		9	40
7	56	7		49
	61	9		44
	40		2	49
8	67	9		47
	55		6	47
9	34	9		47
	90	9½		43
	69		6	43
10	18	4		50
	39	5		47
	54	7		45
	41		6	48
11	14	8		50
	28	9		49
	13		3	48
	17		10	49
	24		23	46
12	74	8		51
	81	8½		43
	65		10	53
13	57	7		33
	59	8		37
	65	9		32
	43		3	37
	47		10	32
14	17	3		52
	30	4		50
	60		2	34
	62		9	43
15	42	8		45
	46	9		43
	32		6	43
16	43	9		44
	34		6	48
17	2	9		37
	21		9	42

TABLE III. A BRIEF OUTLINE OF 12 PATIENTS WHO EXHIBITED A SPECIFIC GRAVITY OF THE BLOOD BELOW 1.040 AT SOME TIME DURING PREGNANCY OR DURING THE PUERPERIUM

PATIENT	OBSERVATION	SPECIFIC GRAVITY OF BLOOD	MONTHS GESTATION	DAYS POST-PARTUM	REMARKS (NOTES FOUND ON HISTORIES OF RESPECTIVE PATIENTS)
1	88	1.039	6		Course uneventful. Discharged tenth day postpartum.
2	76	38	8		Course uneventful.
3	50	36		5	Weight of baby 5 pounds 6½ ounces. Course uneventful.
4	39	31		8	Low forceps; episiotomy; second degree laceration.
5	48	31		3	Low forceps; no damage to mother or child.
6	60	34		2	Second degree laceration. Un-
	62	43		9	eventful puerperium. Patient discharged tenth day postpartum in good condition.
7	58	39		8	Baby stillborn. Diagnosis: Toxemia from dead fetus. Wassermann negative. Fetal heart not heard three days prior to delivery. Temperature 104° nine hours before delivery.
8	59	38		4	Pyelitis of pregnancy. Temperature 101° to 104°. Condition cleared up after delivery, and the patient was discharged in good condition on tenth day postpartum. Weight of baby 5 pounds 7 ounces.
9	57	33	7		Grav. i. Blood pressure, 140/100.
	59	37	8		Albumin two-plus; Blood pressure 140/100. Weight decreasing.
	65	33	9		Albumin three-plus. Hemoglobin 43 per cent.
	43	37		3	Baby died on third day.
	47	32		10	Summary: Patient admitted about one month before expected date of delivery, because of dizziness, headache, weakness, edema of ankles, etc. She delivered spontaneously a premature infant weighing 4 pounds 4 ounces; infant died on third day. After discharge patient was referred to the medical clinic for observation. Electrocardiograph: tachycardia.
10	2	37	9		Toxemia of pregnancy. Blood pressure 210 systolic.
	21	42		9	Weight of baby 9 pounds 5½ ounces. Wassermann negative. On dietary régime blood pressure lowered markedly. Puerperium uneventful. No rise in blood pressure, though blood count revealed secondary anemia. Electrocardiograph revealed no evidence of myocardial pathology.

TABLE III (CONTINUED)

PATIENT	OBSERVATION	SPECIFIC GRAVITY OF BLOOD	MONTHS GESTATION	DAYS POST-PARTUM	REMARKS (NOTES FOUND ON HISTORIES OF RESPECTIVE PATIENTS)
11	14	36		10	Grav. ii. Twin delivery. One stillborn. Red blood count 3.2 mil. Hemoglobin 40 per cent. <i>Summary:</i> Adherent placenta. Second degree laceration. First delivery vertex. Second breech, forty-five minutes later. Placenta was adherent and took three hours for removal. Credé and saline injections into cord first tried and were unsuccessful. Manual removal finally resorted to. Aside from a definite anemia the first week, patient discharged in fairly good condition. Wassermann negative.
12	26	39		80	Grav. ii. Perineal and cervical lacerations. Infant died on ninth day; found to have dextrocardia.

hemoglobin content, fibrinogen content, ash content; by shifting water balances; by alteration of lipid values.

In pregnancy and in the puerperium no one factor alone may be incriminated as the sole agent which so materially affects the weight of the blood. The demands of fetal development are reflected in the altered content of the mother's blood, all of the separate constituents of which are affected, normally, in proper proportions and such alterations are reflected in the specific gravity of the whole blood. Any deviation downward of the physiologic anemia of pregnancy and of the puerperium should herald some pathologic change. However, due regard should be given one's clinical judgment in evaluating the specific gravity of the blood in any given case.

SUMMARY

a. Low specific gravity values may be of aid in differentiating between pregnancy and uncomplicated tumor of the uterus.

b. When the mother's blood density falls below 1.040, the complications of pregnancy and of the puerperium should be looked for.

c. One reason for the increased anemia of the puerperium may be the attendant hemorrhage at delivery. Another reason may be that active lactation may alter the water and mineral balance so as to prolong and intensify the anemia throughout the nursing period, such anemia diminishing as lactation diminishes.

d. A teleologic theory as to the origin of amniotic fluid: Sakuma⁷ injected 10 to 20 c.c. of 1 per cent to 2 per cent solutions of pigments into the ears of gravid rabbits. He found that only the acid types of pigments (trypan red, trypan blue, Congo red, rose bengal, and one or two

others) passed through the amniotic epithelium. The pigment was found in the amniotic epithelium, in the amniotic fluid, in the fetal intestines, but not in the kidney substance of the fetus. He concludes that the passage of the pigment is brought about directly from the maternal body and not by excretion on the part of the fetus.

The anemia of pregnancy is apparently at its height during the seventh month of gestation. In this connection it is of interest to note that Kamei⁸ determined the specific gravity of amniotic fluid in the chick and found it greatest toward the end of embryonic development. This may have some bearing on the nutrition of the embryo, possibly the mineral supply, an increase of which in the amniotic fluid would raise its density, a withdrawal of which from the mother's blood stream would lower her blood density.

In a previous publication³ I commented upon the specific gravity of the blood in 14 cases of fluid collections. All the cases, eight in number, in that series which exhibited blood densities below 1.050 presented free fluid in serous cavities. I was quite impressed by these findings and felt at the time that some extraordinary changes must take place in blood density before free fluid finds its way into serous cavities.

If it is true that the specific gravity of the blood must be altered downward in order to effect a transudation of free fluid into serous cavities, then it would seem that the anemia of pregnancy must be a true physiologic phenomenon, one of the objects of which is to bring about the transudation of amniotic fluid through the amniotic epithelium.

e. The results by the falling drop technic lend themselves to comparison with the sedimentation test in pregnancy and in the puerperium. Bland, Goldstein, and First⁹ have studied a large series of cases. Suffice it to say that the results by both methods are in fair agreement, the practical advantage, I feel, lying with the falling drop method because the determination may be made in two minutes' time.

CONCLUSIONS

a. The falling drop technic for determining the specific gravity of fluids offers an easy, rapid, and accurate orientation as to the status of the blood at any moment.

b. The physiologic anemia of pregnancy was found generally to be represented by specific gravity values of the whole blood between 1.050 and 1.040.

c. The pathologic anemias of pregnancy and of the puerperium are more apt to be represented by specific gravity values of the whole blood below 1.040. However, one's clinical judgment should always prevail.

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555 EAST TWENTY-SEVENTH STREET

INTRAPERITONEAL HEMORRHAGE OF OVARIAN ORIGIN*

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THIS report is based upon 26 cases in which intraperitoneal hemorrhage was noted by the operating surgeons. Fourteen are taken from the records of the Woman's Hospital, while the remaining 12 patients were operated upon in other hospitals in and outside New York City.

* * * *

FREQUENCY

Efforts to determine the incidence of hemorrhage of ovarian origin have been disappointing. In the first place the hospital index-headings do not bring these cases into the open and they are variously sequestered under "cyst of ovary" or as chronic appendicitis, chronic salpingitis, or oophoritis; oophorectomy, resection of ovary, appendectomy, etc. Secondly there are many hemorrhages of minimal degree, insufficient to produce symptoms. Among 992 cases with diagnosis "cyst of ovary" at Woman's Hospital during the five years 1926 to 1930 inclusive, there were eleven cases or 1.1 per cent where blood in the peritoneal cavity was noted at operation, an additional seven cases where the bleeding followed the operative manipulation itself, and three more in which rupture was believed to have occurred at the vaginal preparation for operation, a total of 21 cases (2.1 per cent). The series contained 288 cases of microcystic disease of ovary with bleeding in four (1.4 per cent); 11 cases of dermoid and 11 cases of papillary cyst with bleeding in none. Torsion of the pedicle occurred eleven times, with bleeding in 2 cases at the Woman's Hospital. Warthin found 6 cases from 1895 to 1920 on the Pathological Service of the University of Michigan. Simon found the incidence of ovarian bleeding to vary from 0.33 per cent to 1.04 per cent of all laparotomies on the surgical and gynecologic divisions of Mörby Hospital. Caverly in a recent review of 83 ovarian cysts found hemorrhage into the cyst in 18 per cent but no case of rupture or free bleeding; but in the five-year period studied at Woman's Hospital there were 75 hemorrhagic cysts with intraperitoneal bleeding in 7 cases, or 9.3 per

*Read, by invitation, before the New York Obstetrical Society, October 13, 1931. For lack of space this paper cannot be published in its complete form, but will appear so in the author's reprints.

cent. In a series of 29 ovarian cysts associated with pregnancy, at the New York Lying-In Hospital, confirmed at operation, rupture and intraperitoneal hemorrhage occurred in only one case.

ETIOLOGY AND PATHOGENESIS

Among the host of factors enumerated, a large number concern the origin of ovarian hematoma as well as of intraperitoneal ovarian bleeding, since many cases of the latter are found to be secondary to rupture of a hematoma. On the other hand certain etiologic factors (e. g., adhesions, and sclerosis of the tunica albuginea) tend to impair surface bleeding and at the same time predispose toward hematoma.

* * * *

The causes which act to produce ovarian hemorrhage may be summarized as follows:

I. General Causes Predisposing to Bleeding

1. Acute infections: typhoid, sepsis, acute appendicitis, etc.
2. Acute toxemias: metal poisoning
3. Blood dyscrasias: hemophilia, leucemia
4. Chronic passive congestion: cardiorenal and respiratory disease
5. Hypertension
6. Increased capillary permeability
7. Lowered platelet count
8. Pregnancy
9. Exposure to cold

II. Local Causes

A. In Internal Genital Organs

1. Hyperemia of ovulation, menstruation, pregnancy, and sexual relations
2. Local passive congestion: tumors, pregnancy, torsion of pedicle, malpositions and prolapsus; strains in heavy work, defecation, or sexual excess; postoperative congestion
3. Pelvic inflammatory disease
4. Varicose veins
5. Coexistent tubal pregnancy
6. Trauma: coitus, etc.

B. In Ovary

1. Normal cyclic changes in follicle, corpus luteum and blood vessels
2. Chronic inflammation and sclerosis of parenchyma, tunica albuginea, and blood vessels
3. Interference with follicle maturation, dehiscence and retrogression with consequent cystic degeneration
4. Endometriosis and neoplasm

* * * *

PATHOLOGY

The reported operative, gross and microscopic findings in my 26 cases include most of the nonneoplastic lesions described under ovarian pathology. The effusion is described as thin serosanguineous, fresh bloody, thick tarry or chocolate matter, with or without clots; and its

amount from two tablespoonfuls to over two quarts or "the entire abdomen and pelvis full." The predominating gross finding is a ruptured ovarian cyst (8 times), follicle (3 times), or corpus luteum (eleven times) but in four cases the picture is one of ruptured "chocolate cyst," and in one case that of dermoid cyst, while twisting of the pedicle and rupture occurs in two instances. The appendix is reported normal 14 times, chronically inflamed three times. Inflammation of the adnexa on the side of the bleeding occurs but twice, on both sides once, hydrosalpinx twice, prolapsed adnexa three times. Adhesions are mentioned 5 times, retroversion 3 times, and myoma uteri twice. The chocolate cysts proved to be endometriosis in one case while the others showed the typical pathology of hemorrhagic cyst.

The histologic exclusion of chorionic tissue is theoretically weakened by the failure to serially section the entire ovary (and tubes). In a single instance the hemorrhagic cavity in the ovary was seen to communicate with blood on the peritoneal surface by a narrow channel; and in numerous instances there are found small and large hemorrhages in the ovarian parenchyma subjacent to the surface and even in the tunica albuginea. Microscopic examination of the numerous "hemorrhagic cysts" in the series reveals hemorrhages of all sizes in their walls. These walls are sometimes composed of "nonspecific ovarian stroma," of corpus luteum folds in various stages, of lamellated connective tissue, of granulosa cells or other follicle derivatives; in one instance typical dermoid structures; in another endometrioid tissue. Various disturbances in follicular maturation, microcystic degeneration, connective tissue and leucocytic infiltration, and distortion of stroma and tunica by edema are repeatedly found; and blood vessel changes include great increase in numbers, with their lumen crowded by red cells; or on the other hand sclerosis and hyalinization of their walls with numbers of round cells inside and outside the vessels. The tunica albuginea is by no means uniformly thickened; and the surface epithelium varies from the highest cylindrical to low cuboidal or flat cells, in one case with pseudofollicular inclusions in both tube and ovary. In no case are fetal elements noted; and nothing like cavernous or angiomatous formations occur in the series studied. Beside the chronic productive changes noted there was evidence of ovarian inflammation in a polymorphonuclear infiltration in one case; and the tubes were chronically inflamed in four instances.

The above findings obviously do not satisfy Forssner's first criterion since pregnancy in tube or ovary is not excluded by serial sections; and his third criterion, pathologic alteration in the ovary of sufficient gravity to predispose to severe hemorrhage, is not much better satisfied except in the case with torsion of the pedicle and massive congestion of the ovary. Nevertheless, they do exemplify the multiplicity of changes, anatomical and functional, cyclic and noncyclic; physiologic and pathologic, sudden and gradual, to which the ovary must submit. That these

changes are sometimes accompanied by lesions outside the ovary is self-evident from reports in the literature of ovarian hemorrhage.

* * * *

SYMPTOMS

The clinical grouping of Guyot and Villar is applicable regardless of the pathology present: (1) massive hemorrhage; (2) discrete hemorrhage with signs of peritoneal irritation; (3) hematocele of ovarian origin. In general, these varieties parallel those of ruptured tubal gestation; but the large number of cases with other coexistent pathology inside and outside the ovary, present confusing clinical pictures so that the ovarian hemorrhage is not suspected. Study of the clinical history and physical signs in these cases shows that the history is of chief value in determining the true origin of the hemorrhage. Among the most important of these are the following:

* * * *

Relation of Onset of Pain to Ovulation and Menstruation.—Not noted in 5 cases, unrelated in 6 cases, leaves 15 of the series in which the onset of the pain was related to the last period, as follows:

Pain before last period in 3 cases, 20 per cent (three days, two days, seven days premenstrual).

Pain with last period in 3 cases, 20 per cent (first day, second day, Case XVIII on first day after nine weeks of amenorrhea).

Pain after last period in 6 cases, 40 per cent. Onset on thirteenth to sixteenth day, corresponding to ovulation time.

Of the remaining 3 cases, Case XXVI occurred five weeks after last period in a patient with a thirty-five-day cycle, estimated to be two days overdue. In other words pain occurred at time of "suppressed menstruation." Case XVII followed one day after cessation of the last period which was thought to be one week early; Case VI began as the menses ceased on the fourth day.

From this it is apparent that these 15 cases have the onset of pain closely related either to ovulation in 40 per cent or to the premenstrual and menstrual period in 60 per cent. In other words the first and second weeks after menstrual period seem excluded from the clinical picture of ovarian hemorrhage. The 6 nonrelated cases all had chronic or dull pain over long periods of time. The literature yields the following views: Bovée states that the largest number occur during or close to the period. Relatively few (Bürger, Sudeck, Barolin Case III) occur actually at menstruation, although in Lindig's and Winiwarter's cases the onset was at the estimated due-date of the period but the latter was delayed. The majority of cases began in the premenstrual period (Adams, Luker, Urban, Lockyer, and Benthin). Pankow's case occurred at estimated ovulation time. Simon sums up this relationship thus: The great majority occur in the second to fourth week of the cycle, i. e., from the time of ovulation to menstruation, and this holds for both the massive and discrete hemorrhages.

* * * *

PHYSICAL SIGNS

The general appearance varies from normal, through stages of anxiety and suffering to pallor, prostration, and collapse. The temperature usually 98.6° on admission, pulse varies from 75 to 112, usually good quality. The blood pressure was on average levels. Nothing unusual noted in head, neck and chest, breasts, extremities, and reflexes. The

abdomen usually is symmetric, distended in 2 cases, tender over the lower half in 1, the right lower quadrant in 11, the left lower quadrant in 6, McBurney's region in 5, epigastrium in 1 case. Rigidity noted in 12 cases. Shifting dullness and other signs of fluid are reported in Olsen's case (950 c.c. of blood recovered at operation), not noted in the present series. Pelvic examination is often confusing on account of other coexistent pathology. Intact hymen will often limit the examination to the rectum. The absence of bleeding is noteworthy as is the absence of any softening of cervix, Hegar sign, or uterine enlargement. There were two 3° retroversions and tenderness on motion in 4 cases. The adnexa were tender on one side 9 times, and once on both sides; enlarged or cystic 10 times including bilateral enlargement in 2 cases. A vague fullness in the right fornix was noted in two cases; while in only one case was tenderness in the culdesac reported.

Vaginal puncture not done. Wassermann negative. Aschheim-Zondek test was done once with negative result. Hemoglobin and erythrocyte counts: normal in all but two cases: 75 per cent with R.B.C. 3,950,000 in Case XVII with effusion of one pint of blood; 55 per cent with 2,096,000 in Case XXIII with "abdomen full of fresh blood and clots."

Leucocytes averaged 13,000 in 21 cases with extremes 7,200 and 22,900. Polymorphonuclears average 76.8 per cent, extremes 60 to 92 per cent. Farrar's contention that the leucocytosis is due to peritoneal irritation from extravasated blood rather than to tissue destruction, is borne out by two cases of hemorrhage with high white count reported by Danforth, one from aneurysm of the splenic artery and the other from rupture of the inferior mesenteric vein.

Sedimentation tests in 4 cases averaged 13 mm. for the first hour. In three of these cases, ectopic pregnancy was considered.

Preoperative diagnosis in 25 cases included appendicitis 14 times (8 acute, 3 subacute); ovarian cyst 4 times; ectopic 4 times; ectopic or adnexal disease twice; and acute surgical abdomen due to perforated ulcer or appendix, once. Certainly the physical signs include nothing peculiar to ovarian hemorrhage, pointing merely to peritoneal irritation, to internal hemorrhage of disease of the pelvic organs. The utter dependence upon the clinical history becomes evident.

DIFFERENTIAL DIAGNOSIS

Diagnosis is rendered difficult by the coexistence of various pelvic diseases with the hemorrhage. Discrete hemorrhages are most often mistaken for appendicitis, and by no means is the mistake limited to right-sided ovarian hemorrhage. The pain of appendicitis often grows worse whether or not an interval of respite occurs. In ovarian hemorrhage the pain is very sudden and agonizing and often shows steady recession and disappearance. Pain occurring during the first two weeks after menstruation points away from an ovarian origin. The absence of temperature elevation, and the rapid fall of the leucocyte count and sedimentation rate, argue for extravasated blood rather than for infection. Hence the importance of frequently repeated white counts and sedimentation tests.

The latter points will usually serve also to differentiate inflammatory disease of the adnexa. On the other hand, great difficulty may be had in

those cases with epigastric pain and rigidity, to rule out cholecystitis and perforated peptic ulcer. The history is of paramount importance; while resort to vaginal puncture may *not* clear up the diagnosis, since both ovarian hematoma and tubal pregnancy may be unruptured.

Massive hemorrhage in the young woman will usually be diagnosed as due to ruptured ectopic pregnancy, a mistake of medicolegal rather than clinical importance, since the treatment is in any case operative. Absence of amenorrhea, absence of metorrhagia, absence of presumptive signs and symptoms of pregnancy and absence of the premonitory lancinating unilateral pain of unruptured ectopic, but a history of previous attacks of pain like the present illness, social status precluding legitimate pregnancy, absence of previous pelvic disease or sterility, absence of uterine enlargement and decidual reaction (diagnostic curettage), all point to internal hemorrhage *not* due to pregnancy. On the other hand, a tubal abortion with the syndrome of pain, shock and recovery will be impossible to differentiate, unless the history makes it improbable. The cases studied at Woman's Hospital include mistakes in both directions: Case 44286 operated by Byron Goff appeared at operation to be a ruptured follicle, only upon histologic examination was ovarian pregnancy determined. Case 42162 was discharged without operation with the diagnosis of "ruptured corpus luteum," only to return three weeks later when the ruptured ectopic gestation was confirmed at operation. Numerous cases of chocolate cyst have revealed chorionic tissue at histologic examination; and the reverse occasionally appears. Bissell operated under the diagnosis of bilateral ectopic pregnancy; and active bleeding was demonstrated both from a ruptured corpus luteum on one side and from a tubal pregnancy on the other. Reference has been made to Waters' case of intracystic hemorrhage with the clinical picture of unruptured ectopic. The hormone test may be used in cases that are not too urgent, but a negative result is of little value. Finally, mention may be made of the following reported causes of hemoperitoneum: (1) traumatic rupture of a viscus or mesentery, (2) ruptured aneurysm, (3) rupture of a varicose vein of the broad ligament, or of the pregnant uterus, or of a subserous myoma, (4) reflex uterine bleeding due to an obstructing submucous myoma or to atresia of the genital canal, (5) perforating chorionepithelioma of uterus or tubes (Anspach and Hoffmann; Creysel and Boyer), (6) rupture of the pregnant uterus after cesarean section or myomectomy. Most of these conditions are improbable in the healthy, young nulliparous woman subject to ovarian hemorrhage.

PROGNOSIS

Death from internal hemorrhage was fairly frequent in the days when extrauterine pregnancy was not treated by laparotomy; it is the exception in the untreated ovarian hemorrhage although the literature contains a number of such deaths confirmed by autopsy. Hedde found only 15 cases up to 1913 in which ovarian hemorrhage was dangerous to life.

In the operated cases without complications, recovery follows in practically 100 per cent; and the same is true of the milder cases without intervention. There was no death in Simon's 30 operated cases of corpus luteum hemorrhage, in 14 of which the hemorrhage varied from one-half to more than one liter, while the other 16 cases showed 50 c.c. of blood or less. In the present heterogeneous group of 26 cases there was no death.

Recurrences have been repeatedly verified; and Jayle believes the lesion tends to be bilateral. Of the present series, 18 cases have been followed from one month to three years with recurrence of pain in two cases: one of these is a slight discomfort in the right lower quadrant; the other had several attacks entirely similar to previous attack and leading to the suspicion of "acute abdomen." These attacks subsided under morphine and rest. In six, menstrual disorders have been relieved by the operation; in one case menopausal symptoms have been induced. Case 3 has been operated three years after first operation, and the diagnosis of ruptured ectopic gestation confirmed pathologically. Two patients have had normal labors, a third has had a miscarriage. An interesting immediate result, often reported hitherto, is a red vaginal discharge for one to several of the first ten postoperative days, noted in ten of the 26 histories. Ovarian hemorrhage, even of small size, may be a potent cause of adnexal adhesions found in young girls with no pelvic disease (Gersuny). During the five years, 1926 to 1930, at Woman's Hospital, 46 cases were discharged without operation and with the diagnosis of cyst of ovary, of which 8 were thought to be corpus luteum cysts. One of these returned within a month for operation when ectopic pregnancy was confirmed at operation.

PROPHYLAXIS AND TREATMENT

Normal habits and avoidance of predisposing general and pelvic diseases, as well as the exciting causes such as trauma, exposure to cold at menstrual periods, overexcitement, or physical overstrain seem the best safeguards. Proper treatment of menstrual disorders and malpositions are indicated as well as care in pelvic examination and operative handling. Relief of retroversion and prolapsed adnexa may eliminate passive hyperemia and direct trauma per vaginam. Removal of ovarian cysts, even if small, should be practiced routinely.

Treatment of ovarian hemorrhage in the massive effusions, calls for laparotomy and control of the bleeding. This may necessitate oophorectomy; but usually a wedge-resection or a simple mattress suturing of the ovary will suffice. Bilateral oophorectomy, once recommended by Jayle and Primrose, is never justified for this condition alone. Schumann decries the policy of watchful waiting in ectopic hemorrhage; but many surgeons advocate a preliminary period of observation and supportive treatment, controlled by frequent white blood counts and blood pressure readings. In the smaller or discrete ovarian hemorrhages, delay will

certainly obviate some operations and some mistakes in diagnosis, especially where there is time for one of the hormone tests of pregnancy. Where confusion exists with acute appendicitis, attention to Turner's recent caution will justify the occasional needless operation. He states that appendicitis is still extremely serious, causing 1.2 per cent of the deaths from all causes in this country in 1926. As for the cases that have reached the stage of hematocele, one may recall the counsel of Fritsch: *noli me tangere* unless secondary suppuration and pointing supervene. Naturally in the mixed group of cases here reported, operation was often directed primarily at the diseased pelvic organs, the cure of intraperitoneal hemorrhage being incidental.

CONCLUSIONS

1. In 21 out of 26 cases of intraperitoneal hemorrhage of ovarian origin, the symptoms are related to the bleeding ovary. In 5 cases (19.2 per cent) the other pelvic pathology entirely overshadows the bleeding.

2. Microcystic degeneration as a cause of ovarian hemorrhage is not sustained, although both conditions may be manifestations of a disturbance in the growth, maturation, rupture, and metamorphosis of the follicle.

3. The wide variety of normal and pathologic alterations of the ovary is shown by this series. In the light of these factors, trauma seems only to hasten or aggravate a condition already destined to occur.

4. Correlation between menstrual history, onset of symptoms, and the cyclic stage of the removed ovarian and endometrial tissue should in the future add to our knowledge of the pathogenesis and diagnosis of the condition.

5. Massive ovarian hemorrhage will be mistaken by careful observers for ruptured extrauterine pregnancy unless due weight and credence are given to the clinical history and social status of the patient. The attendant should refrain, wherever the social status of the patient precludes legitimate pregnancy, from making the diagnosis of "ectopic" until it is proved by pathologic examination.

6. Discrete ovarian hemorrhage will be mistaken for acute and subsiding acute appendicitis and lead to unnecessary operation. If the onset of pain be correlated to the estimated ovulation-time as well as to the date of menstruation, and if this relation applies to the previous attacks, one may suspect the ovary; and a rapid fall in white and poly counts and sedimentation rate points to cessation of bleeding as well as absorption of the effused blood.

7. The occurrence of ovarian hemorrhage due to trauma per vaginam adds another to the classical indications for the correction of retroversion and ovarian prolapse.

8. Two things are needed to bring these cases to light: first, report of these excusable mistakes in diagnosis; and second, an index-heading,

"Hemoperitoneum" under which all intraabdominal hemorrhage cases, whatever the cause and severity, can be filed.

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120 EAST SEVENTY-FIFTH STREET

(For discussion, see page 908.)

THE INVESTIGATION OF STERILITY*†

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STERILITY is one of the most important problems facing the gynecologist. A complete study of the subject is possible only in a well organized clinic which includes a personnel equipped to carry out investigations dealing with its many phases.

The efforts of Hühner,¹ Cary,² Moench,³ and others have properly placed the responsibility for a high percentage of sterile matings upon the shoulders of the husband. We agree with Meaker⁴ upon the necessity for thorough medical study of both husband and wife, and upon the importance of seeking multiple etiologic factors in the investigation of each sterile marriage.

History.—A careful history of both husband and wife, taken at separate sittings, will often give leads into proper channels for further investigation. In the marital history, the question of previous marriages and pregnancies arises. Contraception, practised for a number of years, is said by Rubin⁵ to be a factor in the production of sterility. In the present marriage, if there have been pregnancies, a detailed discussion of the terminations, with particular attention to the possibility of postpartum infection, is in order.

*Read at a meeting of the Obstetrical Society of Philadelphia, October 1, 1931.

†For lack of space, it is not possible to include here the special record sheets used in this Clinic, but copies of these may be secured on application to the authors.

Valuable information is at times obtained from the developmental and past medical history. The age of puberty, the development of the skeletal framework, the onset and character of the menses, and the history of illness during adolescence are important points. Meaker⁶ emphasizes developmental arrest in the female as the result of transient glandular insufficiency during puberty. Such arrest is suspected from the history of abnormal menstrual onset or the presence of some constitutional debility at that time. It may leave permanent hypoplasia of the pelvic organs with accompanying menstrual aberrations and sterility.

The history of previous attacks suggestive of pelvic inflammation is occasionally obtained. Minor infections may complicate dilatation and curettage for dysmenorrhea or sterility and, through tubal occlusion, seal the fates of would-be mothers. The possibility of infection following artificial insemination or repeated insufflations improperly done is to be considered. Nonspecific postpartal infections are frequently more easily diagnosed from the history than from the pelvic examination. The induced abortion of the first and undesired pregnancy is a leader among the causes of occluded fallopian tubes. A history of acute appendicitis with operation and drainage should arouse suspicion of perisalpingitis and peri-oophoritis. Discussion of the family history consists of questions as to the fertility of the parents, brothers, and sisters, and the presence of any familial endocrinal disorders.

In the past history of the husband, particular attention is paid to venereal infections, mumps, orchitis or evidence of former genital tuberculosis. Conditions adjacent to the spermatic passages, such as, hernia, hydrocele, and varicocele have little etiologic importance except for the possibility of injury to the spermatic channels at operation. The habits and occupation of the male are scrutinized. Aleoholic or narcotic addiction impair spermatic vigor; workers with lead, phosphorus, or x-rays may be similarly affected.

The sex lives of the individuals must be tactfully investigated. Frigidity, while not an absolute bar, is a restraining influence. It has been shown that sexual excess definitely reduces fertility.

Important points in the present status of the patients are the general health, marked loss or gain in weight and extreme fatigue. Nervous exhaustion in the male may reduce spermatic potency. The menstrual habits are discussed in detail. The presence of amenorrhea, dysmenorrhea, menorrhagia or metrorrhagia may indicate a local or constitutional disturbance resulting in sterility. Full information concerning diet is significant. It is now proved, both experimentally and clinically, that dietary deficiencies result in lowered fertility in both male and female. Macomber⁷ has stressed the importance of diets well balanced in protein, fat, and carbohydrate, as well as vitamin and mineral salt content. A large percentage of sterility patients studied by him showed some form of dietary deficiency.

Physical Examination.—Valuable information may be obtained from the general physical examination of both husband and wife. Particular attention is given to evidence of endocrinal unbalance, constitutional defects and foci of infection. Careful study of the teeth and throat is necessary. Foci here may play a definite rôle in depressed states which lower fertility. In addition to these studies the husband is referred for a genitourinary examination. The ordinary male defects, except testicular aplasia, are unimportant. Inflammatory conditions, involving the epididymis or testicle may produce sterility.

In the routine pelvic examination, evidence of congenital defects, infection, and endocrinal malfunction are sought. Pelvic hypoplasia is now considered to be but local evidence of past or present glandular derangement. The character of the bony pelvis, whether normally feminine with small bones or funnel-shaped (pseudo-masculine) with thick, heavy bones is noted. In many hypoplastic cases the pelvic bones retain their juvenile proportions. The vulva and introitus are carefully inspected. Bartholin's and Skene's glands are examined for evidence of infection. The vaginal pool and chemical reaction are now considered less important than formerly. We agree with Hühner,⁸ Meaker,⁹ and Moench¹⁰ that the alkalinity of the semen and cervical secretion is sufficient to counteract the average vaginal acidity. The use of the precoital bicarbonate douche is not recommended in our clinic because of the likelihood of too great alkalinity. The fertilizing sperm is probably deposited at the external cervical os, and does not ascend from the so-called vaginal pool. The cervico-uterine proportion, in the absence of infection with hypertrophy, is of value in diagnosing hypoplasia. With the normal proportion of the cervix to the uterus, as 1 is to 2, the reverse is frequently seen in severe endocrinal aberrations, with gradations between the two in less marked cases. Of great importance is the viscosity of the endocervical mucus, particularly in the presence of the pin point os. In chronic endocervicitis, an important factor in the production of sterility is the tenacious mucus plug which offers a bar to spermatic ascent.

The condition of the uterine body is noted. Retrodisplacement does not preclude pregnancy, but may reduce its probability. Antelexion is usually to be considered a normal finding, but occasionally it forms part of an endocrinal picture, and under either circumstance the flexion per se is rarely a factor in sterility.

The adnexa are palpated for evidence of inflammatory disease. Multiple small follicular cysts of the ovaries are frequently associated with menstrual disturbances and sterility. The history and clinical picture are of more value in diagnosing this condition than the pelvic examination, since it often escapes detection by palpation.

Special Gynecologic Examination.—In our clinic the study of the male semen is done by the gynecologist. The postcoital examination was popularized by Hühner⁸ in 1913 and usually bears his name. This test is im-

portant and is the first specialized study made. Theoretic doubt has recently been cast upon its dependability by Moeneh,¹¹ who claims that an hour following intercourse the fertilizing sperm is probably well up the cervical canal. However, it is of value, when used in conjunction with routine examination of the sheath specimen. This consists first of estimation of the amount, viscosity and reaction of the semen. Cary believes that repeated small ejaculates indicate lowered fertility. This may be the result of too frequent coitus. Estimation of the number of spermatozoa is made in a manner similar to that of the ordinary blood count. The normal number is 100 to 150 million sperms per cubic centimeter. A count of less than 100,000 per c.c. indicates clinical sterility. A warm stage mount is examined for the relative number, endurance, and motility of the sperms, and for the presence of pus cells. Finally a stained smear is studied for abnormal forms. Moeneh¹² claims that abnormal sperm heads furnish the best index to their fitness for reproduction. According to him, 25 per cent abnormal heads indicates clinical male sterility.

Patency Tests.—Of the two popular tests for the patency of the fallopian tubes, we prefer insufflation for routine work, and utilize the Rubin apparatus with the kymographie attachment. The graphic record is of great value in detailed diagnosis of tubal pathology and in recording the results of repeated insufflations. Should doubt arise as to whether or not gas has passed through the tubes, fluoroscopic demonstration of the CO₂ lemniscus under the diaphragm is employed. This test should be a routine procedure in the study of every sterility problem, without obvious cause, if none of the contraindications are encountered.

Our experience with the use of lipiodol has been limited. In cases of complete tubal obstruction, diagnosed and confirmed by repeated insufflation, we attempt to localize the obstruction by lipiodol injection.

Laboratory Investigation.—Routine examination of the blood and urine is indicated. Moderate to marked anemia is a definite factor in reduced fertility in both sexes. A serologic examination is made although the presence of syphilis is not as great a factor in the production of infertility as it is in miscarriages and premature stillbirths.

If no absolute impediment to fertility has been discovered, the study proceeds into the field of endocrinology. Remarkable advances have recently been made in gynecologic endocrinology, and we are on the threshold of more startling developments, particularly in organotherapy.

Dysfunction of the thyroid gland, as evidenced by clinical signs and basal metabolic disturbances in both male and female, is known to reduce fertility. Endocrinologists state that it is better to take the average of several basal metabolic determinations, particularly when subnormal function is suspected. In the absence of subnormal estimations, with clinical evidence of lowered thyroid activity, cautious treatment along these lines is recommended. This is the only type of organotherapy which at present is recognized as being clinically effective.

Efforts to ascertain pituitary dysfunction are directed along several lines. The most dependable evidence lies in various physical stigmas; faulty skeletal development, abnormal fat and hair distribution, pelvic hypoplasia and various eye changes. The latter facts are obtained from ophthalmologic examination in which, as Mazer¹³ indicated, contraction of the visual fields, enlargement of the blind spot, and increased yellow color of the discs point to pituitary dysfunction. X-ray study of the long bones, skull, and sella turcica are of occasional value. The glucose tolerance test is routinely done because of the increased tolerance for sugars seen in posterior pituitary disease which is frequently associated with dysfunction of the anterior lobe. Blood and urine hormone studies in pituitary investigation are valueless. In the absence of pregnancy, no test is yet devised to detect the normal amount of pituitary hormone in the blood or urine.

In ovarian hypofunction, however, the female sex hormone and the pituitary hormone tests are of value. The Frank¹⁴ test is based upon the action of the female sex hormone upon the lower generative tract of the spayed mouse, namely, the induction of estrus. Frank has demonstrated that in normal, fertile women there is a definite premenstrual increase in the female sex hormone of the blood. In various menstrual irregularities such premenstrual increase does not occur. Likewise, in many women with functional sterility who menstruate regularly, there is no premenstrual increase in the female sex hormone. Hence in regularly menstruating, functionally sterile women, a Frank test, showing no premenstrual wave, is indicative of hypoovarian function.

Confirmation of this is often found in the pituitary hormone test recommended by Fluhmann.¹⁵ This test, a modification of the pregnancy test of Aschheim and Zondek, utilizes the action of the anterior pituitary hormone upon the ovaries of immature mice. Fluhmann and others have demonstrated that in human castrates, from radium, surgery, or spontaneous menopause, there is a compensatory increase of the anterior pituitary function, with more hormone in the blood. Likewise, in sterile or certain amenorrheic subjects with apparent reduction in ovarian function, a definite increase in the pituitary hormone may be demonstrated in the blood, similar to but less marked than that seen in pregnancy. Therefore, in those patients with decreased follicular hormone, as evidenced by the Frank test, and increased pituitary hormone as determined by the Fluhmann test, one may be justified in making a diagnosis of primary ovarian secretory failure. In the other group, presenting no increase in pituitary hormone, the ovarian failure is probably secondary to pituitary dysfunction.

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133 SOUTH THIRTY-SIXTH STREET.

(For discussion, see page 914.)

NUPERCAIN IN SPINAL ANESTHESIA

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THE principles of administration of novocain and the advantages of its use in intraspinal block anesthesia for operations below the diaphragm need no reiteration.

On March 21, 1931, the Council of Pharmacy and Chemistry of the American Medical Association accepted a new anesthetic agent, Nupercain or Percain, synthesized from the quinine nucleus, chemically known as alpha-butyloxyechinonic acid diethylethylene-diamide hydrochloride. For use in spinal anesthesia, it is dispensed in 2 c.c. ampules of a 1:200 dilution in physiologic saline, acidified by one drop of concentrated hydrochloric acid per liter of solution. In this dilution its effects are nontoxic, although pharmacologically it is five times as toxic as cocain when injected intravenously into rabbits and twice as toxic when injected intravenously into dogs.

Satisfactory spinal anesthesia lasting from three to ten hours has been reported by Keyes³ in a series of 46 cases and by Zieger⁴ in a series of 52 cases.

ACTION OF NUPERCAIN

Nupercain has a specific chemical affinity for nerve fibers as does novocain but to a slightly less degree. There is less effect on the sympathetic fibers in the anterior roots which control vasoconstrictor action on the great splanchnic bed of blood vessels. For this reason we have proportionately less fall in blood pressure and maintenance at a more constant level as will be shown later. The decreased toxic action of nupercain is not due to less toxicity of the drug, for this is known to be greater, but to its greater dilution which makes rapid absorption of large amounts impossible.

The serious effect of spinal block is due to the cerebral anemia initiated by the sympathetic paralysis which permits pooling of the blood in the visceral area and in any dependent portion of the body. It is therefore important in using nupercain to counteract splanchnic vasodilatation and blood pressure fall by means of ephedrine, and cerebral anemia by use of the Trendelenburg position.

FACTORS CONTROLLING HEIGHT OF ANESTHESIA WITH NUPERCAIN

It has been shown by a number of investigators that there is no active circulation of the spinal fluid. Therefore the diffusion of substances introduced into the spinal canal is dependent upon the laws of diffusion of one fluid in another within a closed vessel. With novocain crystals dissolved in spinal fluid, the anesthetic mixture has a specific gravity in excess of the normal for spinal fluid of 1005. However, this difference is so small that for practical purposes the chief factor in obtaining height of anesthesia is the amount of spinal fluid withdrawn and reinjected.

Several workers have employed solutions of lighter or heavier specific gravity than that of the spinal fluid, combining with this, posture of the patient to obtain various levels of anesthesia. Pitkin for example introduced such solutions with the claim of increased duration of anesthesia and greater accuracy in placing its level. Spinocain acts as a floating solution while intact but quickly diffuses in the spinal fluid. Novocain, the principal constituent, gravitates, giving primarily a posterior root effect. Although I have followed Pitkin's technic carefully, I have never been able to duplicate his results. My experience has shown delayed anesthesia with predominant posterior root effect, no constant increase in duration, and much greater fall in blood pressure. The latter I am sure is due to a fallacy in the Pitkin technic in which ephedrine is given at the time of lumbar puncture, permitting vasomotor paralysis before a well-sustained ephedrine action can be established. It is important that ephedrine be administered at least ten minutes before administration of the anesthesia.

To obtain various levels of anesthesia with nupercain, the same principle of volume control used with novocain crystals has been employed. The capacity of the spinal canal from the sixth thoracic vertebra to the lower lumbar region is about 8 c.c. The proper amount of novocain dissolved in the withdrawn 8 c.c. of spinal fluid, and reinjected in the second lumbar space will therefore produce anesthesia to the nipple line. Other levels may be accurately obtained by similar injections of varying amounts of the novocain spinal fluid mixture. The above principle is employed with nupercain.

The difference in specific gravity between nupercain in physiologic salt solution and the normal spinal fluid is extremely slight. Novocain mixtures with spinal fluid are definitely of greater specific gravity than is the spinal fluid. A knowledge of these differences in the two solutions is important in comparing and explaining the difference in their anesthetic action. Prompt anesthesia results from novocain because the hyperbaric solution of novocain immediately settles around the posterior roots in the dorsal decubitus position while the isobaric or perhaps hypobaric nupercain solution permits slower contact or establishes anterior

root block first. Jones² therefore suggests that in administering nupercain, the patient be placed in the ventral decubitus position for a few minutes following administration in order to saturate the posterior roots, then returned to the dorsal position to obtain anesthesia of the anterior roots. This procedure will give quicker and more uniform anesthesia.

DURATION OF ANESTHESIA

Anesthesia of approximately one hour's duration is obtained by the use of from 120 to 150 mg. of novocain. Larger amounts of novocain will produce longer periods of anesthesia, but the danger line between the balancing effect of increased doses of ephedrine and the larger amounts of novocain may be reached with undesirable and even serious symptoms following large drops in systolic blood pressure. With nupercain, surgical anesthesia for three to five hours may be obtained with no increase in dosage and with less systemic reaction than with the average dose of novocain. It therefore has a distinct place in regional block in which lengthened anesthesia is required.

A high carbohydrate, nonresidue diet is given the evening before operation and fluids forced to the limit. Although it has not been proved that the barbitol derivatives produce the same specific protective action against nupercain as against novocain poisoning, sodium amytal gr. iii or Nembutal gr. iii are used as a sedative the night before and the dose repeated one and a half hours before operation the following morning. In most cases a decided hypnotic result is obtained from this dosage so that the trip to the operating room is only a dim memory. In addition one-sixth or one-quarter grain of morphine sulphate is given hypodermically forty-five minutes before operation and 50 to 100 mg. of ephedrine administered by hypodermic just before the patient leaves his room. In this way a well established vasoconstrictor action may be obtained before the anesthetic mixture is introduced. A small gauge spinal needle is used for the puncture, which is always done with the patient on one side, the Trendelenburg position being instituted immediately on completion of the administration of the anesthetic. Throughout the administration of the anesthetic the patient's condition is carefully observed and blood pressure readings taken. In case the patient complains of any discomfort, real or imaginary, light gas anesthesia is immediately instituted. This I feel is an important point in the conduct of the case, and one of which many surgeons do not avail themselves. In this way, the patient experiences no physical or psychic shock and the surgeon still has all the advantages of the spinal block anesthesia for his work.

Upon his return to bed the patient is kept in the prone position for twenty-four hours to prevent possible postanesthetic headache. Liquids both for food and fluid intake are started immediately.

ANALYSIS OF RESULTS

A series of 45 cases, personally anesthetized and operated upon, prepared as outlined above, are included in this study. Of this number 20 per cent consisted of operations in the upper abdomen and 80 per cent in the lower abdomen. Of the lower abdominal operations nearly 27 per cent were combined abdominal and perineal gynecologic operations.

Nearly 6 per cent of cases showed some postanesthetic headache as compared with 1.9 per cent in a series of 151 cases previously reported¹ in which novocain was administered. There was a definitely increased incidence of postanesthetic headache following the use of nupercain, although none were severe or of more than twenty-four hours' duration.

No failures were experienced in the cases in which the anesthetic was administered personally. In two cases not included in this series in which the anesthetic was given by interns learning the technic, the results were not satisfactory. If no anesthesia follows the use of nupercain, I feel certain that there has been some error in the technic of administration as in the case of failure following the use of novocain. If the nerve roots are bathed with either solution, anesthesia is assured.

Two patients of this series were given 3 c.c. of nupercain without ill effects or additional advantage in anesthesia; the remainder of the series received 2 c.c. of nupercain.

As will be noted in Table I, greater fall in blood pressure occurred in cases of upper abdominal surgery. Larger doses of ephedrine (100 mg.) are therefore indicated in this type of case. No advantage from larger dosage was derived in the cases of pelvic surgery.

TABLE I

	AVERAGE RISE IN SYSTOLIC BLOOD PRESSURE	PER CENT CASES	AVERAGE DROP IN SYSTOLIC BLOOD PRESSURE	PER CENT CASES
Upper Abdominal Cases	12.5 mm.	4.5	22.2 mm.	24.5
Lower Abdominal and perineal	14.3 mm.	15.5	12.5 mm.	55.5
Total all cases	13.4 mm.	20.0	17.3 mm.	80.0

Personal susceptibility to nupercain is a negligible factor, the only reaction to the anesthetic being occasional slight nausea. Nervousness on the part of three patients was overcome by the use of a light gas anesthesia.

All spinal punctures were made in the second lumbar space. For lower abdominal operations from 4 to 5 c.c. of spinal fluid was withdrawn, 2 c.c. of which were discarded and replaced by 2 c.c. of the nupercain solution. In upper abdominal operations 7 to 8 c.c. of spinal fluid

was withdrawn and 2 c.c. replaced by the nupercain. No advantage was observed by the addition of the 2 c.c. of nupercain to the total amount of spinal fluid withdrawn with reinjection of the mixture under this additional pressure, although it would seem that this procedure would tend to increase absorption and result in quicker and more uniform anesthesia.

The time required for the onset of surgical anesthesia with nupercain is from eight to fifteen minutes. It is important to remember this point in the use of nupercain as compared with novocain, as with novocain sufficient anesthesia is obtained almost instantly. This seeming delay is not a disadvantage, however, as some time must be consumed in preparing and draping the patient.

Table I shows the average increase and decrease of the systolic blood pressure. Keyes³ reports an average fall of 18 mm. in all his cases, which corresponds almost exactly with the figure of 17.3 mm. for this series. He compared this fall in blood pressure with that of 31 mm. following the use of novocain crystals and 39 mm. following the use of spinoecain. He called attention particularly to the decreased but abrupt fall in blood pressure following the use of nupercain, with a constant maintenance of the low level until the pressure gradually returns to normal. With the use of novocain and spinoecain the original decline is more gradual, the lowest point being reached in about one-half hour.

The action of nupercain on sympathetic fibers as typified by the graphic blood pressure curves has a distinct advantage over the action of novocain, in that we do not have to anticipate additional fall in systolic blood pressure as the anesthesia progresses. Therefore there is no late nausea and vomiting as occasionally occurs with novocain, to disturb the operative procedure.

The duration of anesthesia obtained with the use of nupercain is its chief recommendation. Much of the trouble experienced with the use of procain has come from the necessity of increasing doses in order to increase the duration of anesthesia. With the average safe dosage of nupercain, surgical anesthesia is obtained for one and a half to five hours with an average of about three and one-half hours. Partial anesthesia was observed up to seven and eight hours after operation. This feature of lengthened analgesia contributes in no small way to the comfort of the patient in the immediate postoperative period, especially if morphine and sodium amytal are given before the anesthetic effect of the nupercain is allowed to wear off completely.

CONCLUSION

1. Nupercain is a safe and satisfactory agent for spinal anesthesia when used for operations below the diaphragm.

2. It has the following disadvantages as compared with procain crystals: (a) Lengthened period of onset of anesthesia following ad-

ministration, and (b) definitely greater tendency to postanesthetic headache.

3. It has the following advantages as compared with procain crystals: (a) Less variation in individual susceptibility to the drug; (b) less nausea, vomiting and subjective symptoms because of the better sustained blood pressure level; (c) less blood pressure fall and a more constant level after the initial drop; (d) sufficient length of anesthesia with the average nontoxic dose for all operative procedures, the markedly lengthened analgesia promoting greater immediate postoperative comfort for the patient.

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1109 MEDICO-DENTAL BUILDING.

THE USE OF SODIUM ISOAMYLETHYLBARBITURATE (SODIUM AMYTAL) IN THE TREATMENT OF ECLAMPSIA*

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FOR the past year we have employed sodium amytal in the treatment of eclamptic patients, at the Charity Hospital with results so gratifying that we feel that a preliminary report is justified. Two important points are to be observed when it is exhibited by the intravenous route. First, no solution should be used which is not absolutely clear for four or five minutes after its preparation. Second, the rate of administration of the solution should not exceed 1 c.c. per minute. The effects of the drug are obtained almost immediately, the patient as a rule dropping off into what is apparently a normal sleep after 3 to 6 gr. have been injected.

Several phenomena are noted, following the administration of this preparation. The most marked effect is the rapid lowering of the blood pressure, but this drop apparently has no untoward effect, and the pressure soon rises again, but not to the original level. The most marked fall in our series was one of 96 mm. systolic, from 216 to 126. In another instance, a fall of the systolic pressure from 145 to 70 in five minutes was noted, with a rapid reactionary rise to 100. The respiratory rate is usually decreased, but not, as a rule, to a marked extent. In one patient there was a transient fall to nine per minute. There is generally a slight rise in the pulse rate.

Our report covers a series of 30 cases of ante- and intrapartum eclampsia treated by us in the wards of the Charity Hospital during the past year. A few recently admitted patients are not included. Almost as

many patients suffering from postpartum eclampsia have been cared for, but for various reasons we decided not to consider them in detail in this paper. All of them recovered. The essential feature of the treatment employed was the use of sodium amytal, but other measures were employed as adjuvants.

Of the 30 patients, 20 were colored and 10 were white. Their ages varied from fifteen to forty-one years; 12 were under twenty. The majority were primiparae. The number of convulsions prior to the institution of treatment varied from one to a maximum of 12; 10 women had 4 or more seizures. Only 2 patients had convulsions after the first dose of sodium amytal; one developed one seizure shortly after the injection, the other had 2. The systolic blood pressure ranged from 130 to 240 on admission, in 9 instances it was 200 or over. Albuminuria in varying degrees was a constant finding. Ten patients had a total nonprotein nitrogen in the blood of 40 or more. The blood sugar in the majority of cases was below 100; in 10 patients it was below 80, being reduced to 43 in one instance. Only twice was it found to be over 100, the readings being 114 and 117, respectively. These determinations were, as a rule, made shortly after the admission of the patient; we can not state just when the specimens were taken with reference to the convulsions. Four patients had marked pulmonary edema; 3 of them recovered. Nineteen of the 30 women were at or near term, in the other 11 the pregnancies were between the sixth and eighth months.

Twenty-seven of the 30 mothers recovered. The details of the 3 fatal cases are as follows:

CASE 1.—A white multipara had 4 convulsions before beginning treatment, none after treatment was instituted. Labor was induced by catheter thirty-three hours later. She died on the fourth day in coma. This death, we feel, was due solely to the toxemia.

CASE 2.—This was a colored woman, who had recovered from the eclamptic attack, delivering spontaneously twenty-one hours after admission. No anesthetic was used. The patient developed pneumonia, complicated by pneumococcal meningitis, the diagnosis being established by lumbar puncture. This death was not directly due to the eclampsia, but of course the fatal outcome is to be recorded.

CASE 3.—This was a colored woman, who had marked pulmonary edema on admission. There were no convulsions after the treatment was instituted, and the edema of the lungs was relieved by appropriate treatment. She was delivered by a very easy low forceps operation seventeen hours after admission, as the head, after reaching the perineum, made no further progress. Through a misunderstanding, ether was used as the anesthetic. The pulmonary edema recurred, bronchopneumonia developed, and death resulted. We feel that this fatality was due to the anesthetic. We are, of course, thoroughly cognizant of the fact that general anesthesia, especially when induced by ether, is badly borne by eclamptic patients. We believe that this patient's chances of recovery would have been much enhanced by the employment of spinal analgesia or local perineal infiltration for the delivery.

Thus we have a gross maternal mortality of 10 per cent, or a corrected rate of 3.3 per cent.

As regards the babies, we find that 21 were born alive, and were discharged alive; 9 were stillborn; 24 were known to be alive when the patients were admitted; of these, 21 were born alive, and 3 were stillborn, probably due to the toxemia. Of the 6 other stillborn babies, 2 were known to be dead on admission, 2 others were macerated on delivery and were probably dead on admission (they were also premature), while the remaining 2 (also premature) were probably alive on admission. Thus, of the 9 stillborn babies, 4 were premature, and 5 were at or near term. As will be noted later, there were only 7 operative deliveries; it is possible that resort to forceps in some of the other patients, or earlier employment of operative measures in some of the patients thus assisted, might have slightly lowered the fetal mortality.

We have endeavored to follow a definite routine in the care of these patients, which is altered somewhat to fit the individual case. The treatment may be outlined as follows:

1. On admission, $\frac{1}{4}$ gr. of morphine sulphate is given hypodermically. This has often been given before the patient reached the hospital. It may be repeated in case of slight or moderate restlessness.

2. Five-tenths gram ($7\frac{1}{2}$ gr.) of sodium amytal is given intravenously as soon as it can be prepared, usually within fifteen to thirty minutes. If the convulsions recur, or if there is marked nervous irritability, this may be repeated as often as deemed necessary. Only a few such extra doses were given in this series.

3. As soon as the full effect of the amytal is obtained, the stomach is washed through a Jutte or similar tube, and two ounces of 50 per cent magnesium sulphate are administered through the tube. This drug may be repeated later orally, if indicated.

4. A specimen of blood is secured for chemical analysis.

5. Through the same needle, 300 to 400 c.c. of blood may be allowed to escape, if there is very marked hypertension. This was not done in all our cases.

6. Again using the same needle, 1000 c.c. of a 10 per cent solution of glucose is administered, without insulin. This is usually repeated in twenty-four hours. In most cases, we have given in addition 50 c.c. of 50 per cent glucose by vein twelve to fifteen hours after admission, thinking thereby to ensure better renal function.

7. At a convenient time, a soapsuds enema is given. This is eliminative, and also prepares the rectum for the rectal administration of the sodium amytal, if thought proper. This enema is repeated when needed.

8. Thereafter, sodium amytal, in 3 gr. doses, is given by mouth or by rectum (the more frequent route), every four hours. This is continued until it is felt that all danger of recurrence of the convulsions is past, generally thirty-six to forty-eight hours.

9. Only water or a glucose and water mixture, by mouth or through the Jutte tube, is given until the patient is fully conscious, then a liquid or light diet, rich in carbohydrates, is allowed.

10. If there is edema of the lungs, 1/50 grain of atropine sulphate is administered hypodermically, and repeated in three or four hours, if necessary. We have found that novatropin, 1/20 grain every two hours, is very reliable in such an emergency. Circulatory stimulants are given if indicated.

11. If labor does not supervene spontaneously, induction by one of the approved methods is performed, generally about forty-eight hours after admission. In our series, this was necessary in only eight cases; the catheter was employed 6 times and the bag twice, using sodium amytal intravenously (in doses of 8 to 12 gr.) as the anesthetic.

12. Labor, as a rule, is allowed to terminate spontaneously. Forceps or version may be resorted to in order to shorten the second stage. In this series, low forceps was employed 6 times, and version once. Nitrous oxide oxygen or ethylene may be used as the anesthetic; spinal or local analgesia might be employed to advantage. As noted above, the one patient delivered by low forceps under ether anesthesia died of pulmonary edema and bronchopneumonia. It is possible, as stated in considering the fetal mortality, that more frequent resort to operative delivery might have effected an improvement in this respect; it is also possible that such a policy might have resulted in an increase in the maternal mortality rate.

It will be noted that this treatment consists essentially of sedation by sodium amytal, reinforced by elimination. The intravenous glucose, while highly desirable, might be omitted if conditions were such as to preclude its use. It will be seen that there are five measures resorted to in the treatment outlined above: (1) the preliminary hypodermic administration of morphine sulphate; (2) the exhibition of sodium amytal intravenously, orally, and rectally; (3) elimination by gastric lavage, purgative, and enema; (4) the intravenous use of glucose solutions; and (5) the avoidance of radical operative measures, limiting the procedures to low forceps, breech extraction, version, and the occasional induction of labor.

It might be argued that these adjuvant measures, particularly the use of morphine, are chiefly responsible for the eminently satisfactory results obtained. In answer, we would stress the very prompt suppression of the convulsive seizures following the injection of the first dose of sodium amytal, which is almost dramatic, and the prolonged, quiet sleep which ensues. No such results have been obtained by us in a fairly extensive experience with eclampsia from the use of morphine alone, and while the Stroganoff treatment has proved eminently satisfactory in our hands, the control of the convulsions has been gradually brought about in most cases, rather than being noted as an immediate result, as in this series. The eliminative measures, we feel, are necessary, no matter what form of therapy is employed, and the same we believe to be true as regards the use of glucose.

We feel justified in drawing the following conclusions:

1. That sodium amytal is a safe and efficient hypnotic and sedative, with marked anesthetic properties when given intravenously.
2. That it is of great value in the treatment of eclampsia, as is shown by the fact that, in the 30 cases here reported, the eclamptic convulsions were promptly controlled in every instance. This is in accord with the results obtained by others.
3. That the preparation is worthy of a more extended trial in the treatment of eclampsia, especially as the treatment is simple and may be readily carried out in the home, if hospitalization is not practicable.

SOME PRACTICAL ASPECTS OF HYPOTHYROIDISM

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HAVING become increasingly impressed during the past few years with the importance of hypothyroidism in certain gynecologic and obstetric conditions and having found little emphasis placed upon it in the current literature, it appeared justifiable to present abstracts of a series of case histories in which this condition was the proved causal factor, or in which it was fair to assume that it was predominantly contributory.

Although reference has been made to the lack of emphasis in the literature, it is only right to add that no effort has been made towards an exhaustive review. Occasional case reports have been found in the current literature; Novak has made repeated reference to the condition in his publications; Maranon makes some mention of it in his book "Critical Age"; and other standard works appear to have some cognizance of its existence. The impression gained, however, is that it is a matter of little and only occasional importance.

The present series includes the abstracts of 25 case histories. These are unselected, except that the total number of abstracts has been limited to 25 and has been restricted to what appears sufficient to point the contention that hypothyroidism is neither an infrequent nor an unimportant complicating factor in gynecology and obstetrics. The cases have been divided into an obstetric and a gynecologic group. In the former, there are eight cases, grouped in pairs to emphasize the conditions. In the gynecologic group, there are 17 cases, the last being the only case of hyperthyroidism giving a somewhat similar clinical picture. This case is included to emphasize the possibility of this occurrence and also to emphasize its relative rarity compared to hypothyroidism.

Cases 5, 6, and 7 of the obstetric group were seen in the Gynecological Clinic of the Public Health Center of this city. All others were private patients.

The eight obstetric cases are paired as follows: two of missed abortion, two of habitual abortion, two of pseudocyesis, and two of subinvolution.

CASE 1.—F.W., forty-one years of age. This patient had a miscarriage early in 1923. She had subsequent menorrhagia, with shortening of the interval; tendency to weight gain, and vertical headache. Treatment started November 28, 1923. Metabolism reading: -23 per cent. Complete relief of symptoms.

CASE 2.—F.W., thirty-seven years of age. Miscarriage in 1923. Subsequent menorrhagia and metrorrhagia. Metabolism reading: -19.6 per cent. Treatment started December 19, 1923, with amelioration of symptoms. Subsequently carried to full-term pregnancy and delivered of living child in November, 1924, under thyroid medication.

CASE 3.—F.W., thirty-five years of age. Habitual abortion, miscarriage, or death of fetus. History of empiric, incomplete, antisyphilitic treatment based on marital history. Blood Wassermann negative. About three months pregnant when first seen. Metabolism reading: -10 per cent. Carried successfully through pregnancy on thyroid medication.

CASE 4.—F.W., thirty-eight years of age. Habitual abortion. First seen about sixth week of pregnancy. Metabolism reading: -12 per cent. Carried successfully to term on thyroid medication.

CASE 5.—F.C., twenty-three years of age. Amenorrhea of almost nine months' duration. Carried in Prenatal Clinic until prenatal examination at eight months. Not pregnant. Metabolism reading: -19 per cent. Restoration of menstruation under thyroid medication.

CASE 6.—F.C., twenty-four years of age. Amenorrhea for several months. Carried in Prenatal Clinic until prenatal examination. Not pregnant. Metabolism reading: -13 per cent.

CASE 7.—F.W., twenty-seven years of age. Persistent lochia for three months. Absolute pregnancy gain of eighteen pounds (from 125 to 143 pounds). Metabolism reading: plus 2 per cent. This was the only patient in whom a plus finding was found. Patient was given thyroids gr. i daily. Prompt cessation of lochia. Weight loss of five pounds, with constant pulse between 68 and 75. After first month, weight and pulse remained constant and there was no recurrence of flow.

CASE 8.—F.W., thirty-two years of age. Persistent lochia for two months. Absolute pregnancy gain of thirteen pounds. Metabolism reading: -12 per cent. Cessation of lochia under thyroid therapy.

In the gynecologic group of 17 cases, menorrhagia was predominantly the presenting complaint. This was frequently accompanied by shortening of the intermenstrual interval. In some of the patients, there was lengthening of the intermenstrual interval and, in some, nervousness was the predominating symptom. In all of these patients, a careful search was made for local cause before the taking of a basal rate.

CASE 9.—F.W., thirteen years of age. Very profuse menorrhagia. First seen January 25, 1927. Had already received various types of medication in effort to control flow. Metabolism reading: -15 per cent. Prompt control of very profuse flow under thyroid medication. Gradual establishment of normal cycle.

CASE 10.—F.W. twenty-three years of age. Menorrhagia, for which curettement had been performed three months earlier. Metabolism reading: -10 per cent. Definite improvement in menstrual picture under thyroid medication, during two months under observation.

CASE 11.—F.W., thirty-four years of age. Menorrhagia of gradual onset over past two years. Recently very profuse. Had already had tentative diagnosis of fibroma uteri and confirmatory examination under anesthesia, with probable myomectomy, had been advised. Metabolism reading: -22 per cent. Restoration of normal menstrual cycle under thyroid medication.

CASE 12.—F.W., twenty-four years of age. Irregular and profuse menstruation. Menses appeared at nineteen years of age. Interval three to five months. Flow moderately profuse (eight to nine napkins daily). Metabolism reading: -9 per cent. Later metabolism reading: -19 per cent. Establishment of normal menstrual cycle under thyroid medication. This was one of the earlier patients, coming under observation in October, 1925, and there was considerable hesitation in using adequate doses of thyroid until the later rate of -19 per cent was obtained.

CASE 13.—F.W., forty years of age. Menorrhagia. Metabolism reading: -10 per cent. Complete subsidence of symptoms under thyroid medication.

CASE 14.—F.W., thirty-six years of age. Menorrhagia. Sterility of seven years' standing, following two normal pregnancies. Metabolism reading: -7 per cent. Cessation of menstrual symptoms under thyroid therapy. Conception after ten weeks of therapy.

CASE 15.—F.W., thirty-nine years of age. Menorrhagia. This was one of the earlier patients and the original test gave a slight positive metabolic rate. The rate was repeated after about two years and gave metabolism reading of -13 per cent. Restoration of normal menstrual cycle under thyroid medication.

CASE 16.—F.W., thirty-seven years of age. Menorrhagia and metrorrhagia. Metabolism reading: -14 per cent. Recovery from metrorrhagia and restoration of relatively normal menstrual cycle under thyroid medication.

CASE 17.—F.W., thirty-eight years of age. Irregular menstruation (shortening of interval). History of pelvic plastic and uterine suspension. Subsequent roentgenotherapy, although existence of hypothyroidism had been previously established. Temporary amenorrhea. Recurrence of irregular flow, accompanied by nervousness and "flashes." Metabolism reading: -17 per cent. Disappearance of symptoms under thyroid and amniotin therapy.

CASE 18.—F.W., twenty-six years of age. Profuse menorrhagia. Metabolism reading: -14 per cent. Left observation.

CASE 19.—F.W., twenty-five years of age. Menorrhagia. Previous operation for ovarian cyst with twisted pedicle. Metabolism reading: -7 per cent. Left observation.

CASE 20.—F.W., twenty-eight years of age. Shortening of menstrual flow. Inter-menstrual "spotting." Three-year sterility. Metabolism reading: -15 per cent. Improvement under thyroid medication, but left observation.

CASE 21.—F.W., twenty-four years of age. Menorrhagia. Metabolism reading: -9 per cent. Definite improvement under thyroid medication. As this patient was underweight, it was necessary to watch the thyroid dosage very closely, and it was felt that there was some doubt as to the desirability of adhering to thyroid alone.

CASE 22.—F.W., thirty-six years of age. Dysmenorrhea, slight menorrhagia and extreme premenstrual nervousness. This patient has been under observation only a few months. As the nervous symptoms and dysmenorrhea were predominant, it might be expected that the improvement might be more gradual than with menorrhagia alone. Such has been the case. There has been complete relief from the menorrhagia and improvement in the other symptoms, under thyroid medication. The metabolism reading was -13 per cent.

CASE 23.—F.W., thirty-six years of age. Menorrhagia. Metabolism reading: -2 per cent. Definite improvement under small doses of thyroid. Although this

patient was definitely overweight and gave other physical changes suggestive of hypothyroidism and showed improvement under thyroid therapy, the very slight change in rate rendered the diagnosis questionable.

CASE 24.—F.W., thirty-five years of age. Nervousness and irregular menstruation (lengthened interval). Metabolism reading: -7 per cent. This was considered one of the more doubtful cases. However, there was control of nervous symptoms and restoration of normal menstrual cycle under thyroid medication.

CASE 25.—F.W., twenty-seven years of age. Backache, persistent bitemporal headache, nervousness and shortening of the menstrual interval to three, or even two, weeks. Miscarriage several months before. The backache proved to be orthopedic. The metabolism reading was plus 23 per cent. This case is included to emphasize the possibility of hyperthyroidism, producing very similar symptoms to the much more common hypothyroidism and also because it is the only case of hyperthyroidism found in this series. This latter finding is significant in view of the somewhat hesitant declaration of those who have written on the subject in regard to the relative frequency of the two conditions as a cause of menorrhagia.

TABLE I

DIAGNOSIS	NUMBER	CURED	IMPROVED	UNIMPROVED	LEFT OBSERVATION
Habitual abortion	2	2			
Subinvolution	2	2			
Menorrhagia*	13	8	3		2
Menorrhagia and metrorrhagia	1	1			
Shortening of interval	1	1			
Shortening of flow and intermenstrual "spotting"	1				1
Nervousness and lengthened interval	1	1			
Dysmenorrhea, menorrhagia and premenstrual nervousness	1		1		
Total	22	15	4		3

*The two cases of missed abortion, who presented for treatment for menorrhagia, are included under this heading. Cases treated 19, Cases cured 15 or 79 per cent, Cases improved 4 or 21 per cent.

SUMMARY

The abstracts of 25 case reports are submitted, in 24 of which slight to moderate hypothyroidism existed in company with other symptoms. In 79 per cent of the patients that remained under observation for a sufficient period to justify conclusions, complete relief of symptoms followed thyroid medication. In the remaining 21 per cent, improvement was sufficiently marked to make other treatment unnecessary. In the gynecologic group, menorrhagia was the usual presenting symptom. During the period in which these patients were seen, only one patient was seen in whom the picture of menorrhagia, with shortening of the intermenstrual interval, was accompanied by hyperthyroidism.

CONCLUSIONS

Slight to moderate degrees of hypothyroidism may be very important causal factors in a number of gynecologic and obstetric conditions.

These include amenorrhea and, more frequently, menorrhagia and probably include abortion, miscarriage, premature labor, and death of the fetus.

Hypothyroidism is one of the more frequent causes of menorrhagia and metrorrhagia and should be excluded before resort is had to the curette, radium, x-ray, or abdominal section.

164 MARKET STREET.

SYMMETRICAL CORTICAL NECROSIS OF THE KIDNEYS IN PREGNANCY

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SYMMETRICAL cortical necrosis of the kidneys in pregnancy was first described by Bradford and Laurence¹ in 1898. Jardine and Teacher² in 1910 reported two cases, and Jardine and Kennedy³ in 1913 reported three cases. In 1913 Rolleston,⁴ in a complete review of the literature, was able to collect eleven cases incident to pregnancy. Carson and Rockwood⁵ reported a typical case from this laboratory in 1926. Shriver and Oertel,⁶ reviewing the literature to date (1930), find in all, 37 cases of symmetrical cortical necrosis. They add three cases of their own; one of the patients recovered. Of these 40 reported cases, all but 7 are incident to pregnancy, and of the 33 cases occurring in pregnancy a high percentage have a definite history of retroplacental hemorrhage, there being only one recorded live birth at delivery. To these 40 reported cases we should like to add one which is typical in all respects.

CASE REPORT

Mrs. M. W., aged twenty-six, primipara, was first seen in her home in the late afternoon of May 26, 1931. Her complaint was a dull drowsy feeling and a bilateral backache over both kidney fossae. Some vomiting had attended the drinking of large quantities of water. A moderate vaginal bleeding had been present since morning. Questioning elicited the fact that she had been perfectly well until the morning of the day she was first seen, having worked the day previous. Her last menstrual period occurred in December, 1930 and she had had no vaginal bleeding since. Nocturia had been present twice nightly for the past year, otherwise her history was entirely negative. She had had no prenatal care. A hasty examination revealed a well nourished white female, somewhat restless but rather drowsy. Her face was moderately edematous but no edema was noted on other parts of the body. She stated that her vision was somewhat blurred, and there was a slight acetone odor to her breath. The skin and mucous membranes were very pale. Pulse 96. Temperature 98.2°. Respirations 24 per minute. On abdominal examination no tenderness was elicited over either kidney fossa. A firm, rigid, midline tumor was palpable and was taken to be a pregnant uterus in about the twenty-sixth week of pregnancy. No fetal heart could be heard. A rectal examination confirmed the diagnosis of a pregnant uterus. The external os was contracted and would not admit the tip of the index finger. There was no

vaginal bleeding at the time of examination. The patient was admitted to the University Hospital on the evening of May 26, 1931, quite dyspneic, toxic and exhausted. She could be aroused for short periods of time, but lapsed into a semicomatose condition when undisturbed. The skin was very pale, warm and dry. There was some puffiness around the eyes. The respiratory movements were shallow and rapid, and the patient was apparently having a distinct air-hunger type of breathing. The percussion note was somewhat dull at both bases and a few moist rales were heard over these areas. The heart sounds were clear, regular, but a bit angry. The blood pressure was 180/110.

TABLE I

URINE				BLOOD		BLOOD CHEMISTRY				
HOSP. DAY	VOL. C.C.	SP. GR.	ALBUMIN	R.B.C.	W.B.C.	N.P.N.	URIC ACID	CHLORIDES	CO ₂	B.P.
1	25	1.028	2-plus	40 HPF	40 HPF					180/100
2	0	—	—	—	—	55	7.69	295	24	
3	0	—	—	—	—	—	—	—	—	180/100
4	0	—	—	—	—	—	—	—	—	
5	0	—	—	—	—	—	—	—	—	160/40
6	15	—	4-plus	4-plus	4-plus	—	—	—	—	
7	0	—	—	—	—	133	13.3	285	15	140/0

	R.B.C.	W.B.C.	DIFFERENTIAL		
May 28	1,970,000	18,100	Polymorphonuclears	85%—	Lymphocytes 11%— Trans. 4%

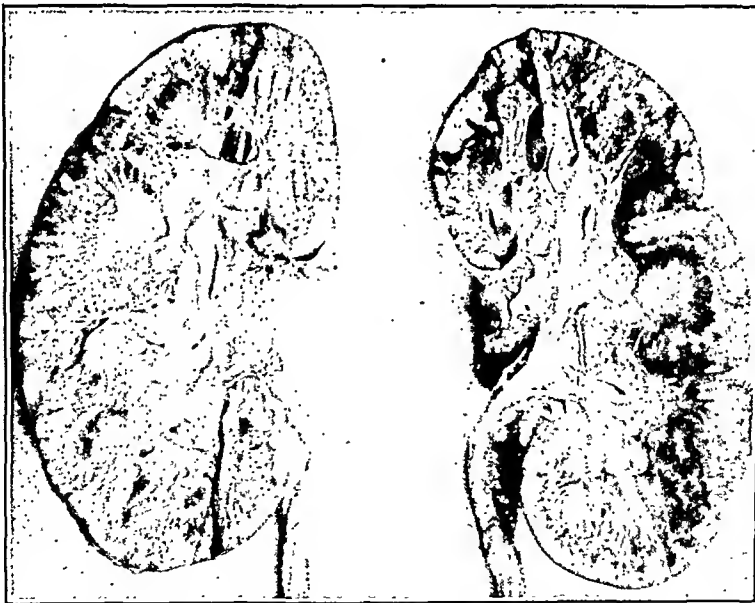


Fig. 1.—Posterior halves of kidneys showing cortical necrosis.

On admission the patient was catheterized and only 25 c.c. of urine was obtained. During the remainder of her hospital stay, only 15 c.c. more were obtained, although she was frequently catheterized in order to obtain a specimen. The patient was quite toxic at all times, being roused with difficulty and falling back into a semicomatose condition quickly. Her systolic pressure varied between 180 and 140. The diastolic pressure was at its highest (110) on admission but rapidly fell until it was practically 0 for the last three days in the hospital.

Glucose was given by vein three or four times daily in the hope of stimulating a diuretic action and to supply fluid and nourishment. Three days after admission, at 8:15 P.M. on May 29, the patient began having rather strong uterine contractions. On examination the cervix was found completely dilated and obliterated with the membranes hanging from the vagina. At 8:35 P.M. a spontaneous delivery of a dead, premature, female child took place. A very large blood clot was expelled and the placenta followed with but little manipulation. The latter was distinctly pathologic in appearance, dark red, mottled with infarcts but seemed to be complete. Following delivery for two days the patient's condition remained approximately the same with no improvement. The same treatment was followed but almost complete urinary suppression persisted, and with a gradually rising nitrogen retention and an increasing acidosis, the patient fell deeper into coma and became more and more dyspneic, and respiration finally ceased on the evening of June 1.

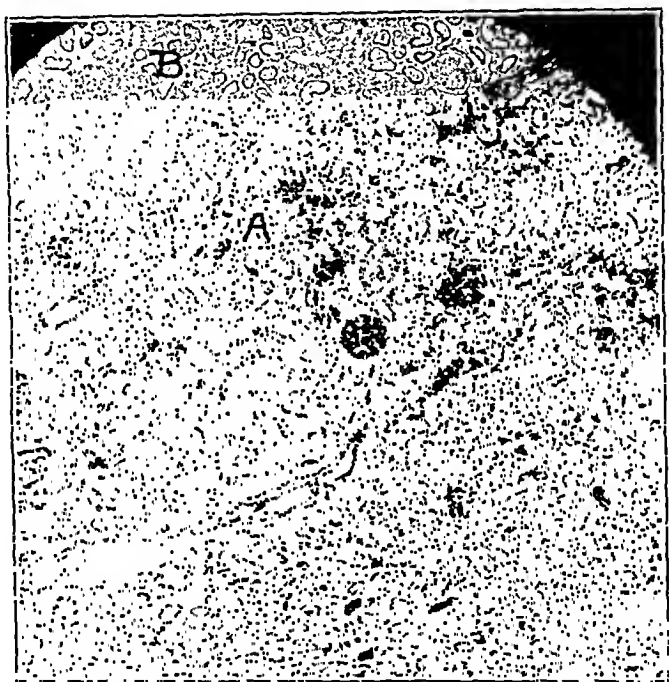


Fig. 2.—Section of kidney cortex. A, Segmental zone of hemorrhage and thrombosis. B, Necrotic tissue.

Autopsy Findings (No. 1709).—This partial necropsy was performed on a well-developed and nourished white female, apparently about twenty-five years of age. The body measured 168 cm. in length and showed the following external evidences of pathology. A generalized subcutaneous edema, most marked about the face and lower extremities; multiple needle puncture wounds in both antecubital fossae with ecchymosis and extravasation of blood; full rounded, firm breasts, from which colostrum could be expressed. A palpable midline tumor mass extended from the symphysis pubis to several cm. below the umbilicus. There was no evidence of external injury, no glandular enlargements and no bony deformities.

An abdominal incision was made from the xyphoid process of the sternum to the symphysis pubis through a moderately obese, edematous abdominal wall. The peritoneal cavity contained 500 c.c. of a clear fluid. The palpable midline tumor was a recently pregnant, subinvolved uterus, which was edematous and boggy and of a deep purplish color. The coils of the small intestines were somewhat distended with gas but were rather equally distributed throughout the upper two-

thirds of abdomen. The liver, spleen, and remaining abdominal viscera were disposed in a normal manner.

The liver and biliary apparatus were removed and examined. The gall bladder contained no stones and the fluid bile could be expressed without difficulty into the duodenum through an unobstructed cystic and common duct. The liver weighed 1,450 gm. and measured 24 by 18 by 8 cm. and externally presented a pale uniform appearance through the capsule. Its consistency was uniformly firm. The cut surface showed a uniform, pale, finely lobulated architecture with no gross areas of hemorrhage or necrosis.

The spleen weighed 180 gm. and measured 13 by 7.5 by 4 cm., and, aside from its firmness and pallor, showed no evident gross pathology either externally or on the cut surface.

The pancreas was heavily infiltrated with fatty tissue, but its size and weight was within normal limits. It presented nothing unusual.



Fig. 3.—Section through necrotic zone showing hyaline thrombus in small arteriole with hemorrhage and necrosis, renal parenchyma.

The adrenals grossly appeared normal.

The kidneys were the site of an interesting condition. These organs were moderately enlarged and embedded in more than the usual amount of perirenal fat. The entire postperitoneal areolar tissue was edematous and water-logged. The right kidney weighed 200 gm., the left 180, and they appeared identical. The capsule stripped off readily, leaving an irregular, finely granular, yellow cortex mottled with hemorrhagic areas and fine red streaks apparently due to capillary dilatation. A few fetal lobulations still existed. On the sectioned surface practically the entire cortex presented a swollen, bulging, pale yellow necrotic appearance, mottled with areas of hemorrhage. This characteristic putty-like appearance extended well down through the columns of Bertini with an accentuated demarcation between the pale necrotic cortex and the pyramids. It appeared almost as an infarction of the cortex. The cortical zone measured 8 mm. on an average in thickness. A few areas of deeply striated functioning cortex remained, irregularly scattered here and there. The right pelvis was somewhat dilated, hold-

ing about 20 c.c., with some mucosal injection. The right ureter was dilated 1 cm. from the brim of the pelvis, proximally. The contracted bladder contained but a few c.c. of a cloudy, turbid, thick urine. The edematous, boggy uterus when opened showed a posterior fundal placental site with a few placental fragments

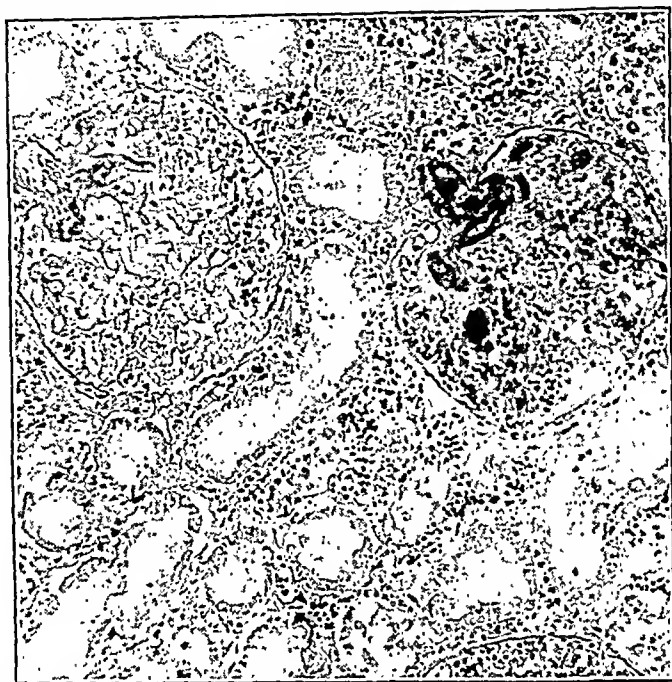


Fig. 4.—Section through necrotic zone showing thrombi in capillaries of glomerular tufts.

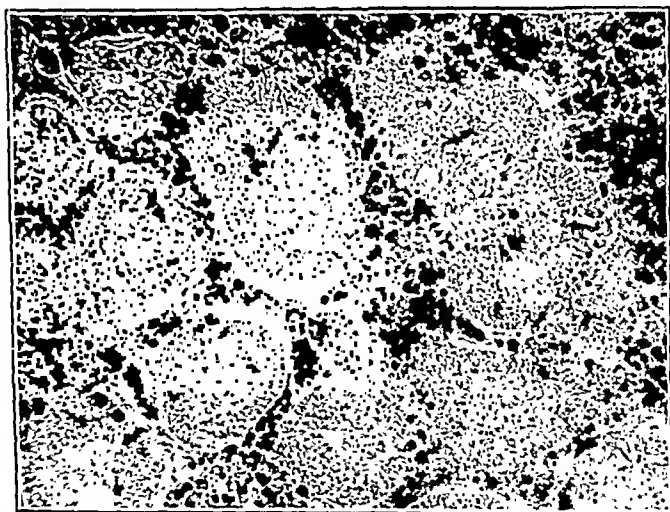


Fig. 5.—Section through the necrotic zone, stained by Herxheimer's method for fat, shows globules of fat in the intertubular capillaries. There are also small droplets of fat in the necrotic tubular epithelium.

and fetal membranes remaining. The thinned out cervix showed some laceration and admitted three fingers. The remaining pelvic adnexa appeared normal for this stage in pregnancy. The gastrointestinal tract showed nothing unusual. Autopsy was limited to abdomen.

MICROSCOPIC

Numerous sections from both kidneys were studied. In the H. & E. stained sections there was some fibrous thickening of the capsule and some detachment from the cortex in areas, apparently due to edema. Large topographic sections gave an appearance of patchy infarction, large areas of the cortical element, both tubules and glomeruli, being in a state of coagulation necrosis. In spite of this apparent necrosis, the general architectural arrangement was preserved without dissolution. The nuclear elements of cells in these zones were fragmented, pyknotic, or entirely absent, the pale pink staining cell wall and cytoplasm remaining as a shadow. A fairly sharp line of demarcation was present between these necrotic zones and the surrounding, functioning cortex. Along this margin there was extensive leucocytic infiltration and extravasation of red blood cells into and between tubules and into glomeruli. A narrow rim of fairly well preserved cortical tissue was present just under the capsule, showing that this area had a capsular blood supply which was not involved in this process. The majority of arterioles in the zone of coagulation necrosis showed intimal roughening and hyaline thrombosis. Frozen sections stained by Herxheimer's method were interesting because of the unusual amount of intravascular fat. The thrombosed cortical vessels and intertubular capillaries, as well as glomerular tufts were practically loaded with globules of fat. The fat present was not entirely confined to the vascular system, however, for many fine droplets were observed in the degenerated tubular epithelium.

DISCUSSION

In reviewing the literature on this subject, a relatively clear-cut clinical entity was found. Several instances of cortical necrosis have been reported during the course of infectious diseases in both sexes, even in children (diphtheria "Stoeckenius," pneumonia and peritonitis "Herzog"), but by far the majority of these 40 cases have occurred in females, from the fourth month to term, following some accident during pregnancy, usually retroplacental hemorrhage. In only one instance has the fetus been born alive (Jardine and Kennedy). In this case twins were delivered. There may be no antecedent history or clinical signs suggesting renal involvement beforehand, but edema is common to a greater or lesser degree preceding the urinary suppression (anuria). Anuria is one of the most constant symptoms and is usually complete or practically complete, coming on from several days before delivery to several days postpartum and continuing until death. Vomiting, although a rather persistent and outstanding symptom in this case, is not the rule. A gradually increasing nitrogen retention with a rather rapid accumulation of creatinine, as opposed to its slow rise in such conditions as chronic interstitial nephritis, is an outstanding feature, as pointed out by Shriver and Oertel.

As regard blood pressure, only a few cases are available, where repeated determinations have been made. In these there is a tendency for the pressure to drop with the progress of the disease, but whether this fall has a cause or effect relationship to the renal condition cannot be determined.

The distribution of this aptly named symmetrical cortical necrosis clearly indicates that the pathologic changes are on a circulatory basis, but whether the vascular lesion be thrombotic, embolic or a vasoparesis with stasis as suggested by Shriver and Oertel, is not as yet definitely proved. There is no doubt but that there are thrombi in the majority of arterioles in the necrotic cortex of this kidney. This thrombosis is only present in the segmentary level of cortical necrosis. The topography of the lesion alone speaks against an embolic phenomenon, for it would be unusual for multiple emboli to choose in such a regular manner this particular level in the kidney cortex. Fat embolism apparently bears no causal relationship to this condition. Wright¹¹ in an article to be published on this subject finds areas of advanced tubular necrosis in a fatal case of fat embolism. The necrosis in his case, however, is not generalized and is without regular or symmetrical distribution. The absence of discernible intravascular fat in other organs rules out a generalized fat embolism. It is a well known fact that during the latter half of pregnancy there is a hyperlipemia. Slemmon and Stander⁹ found a gradual increase in the fat content during the latter half of pregnancy, there being 900 mg. per 100 c.c. of maternal blood at term. The cause of this hyperlipemia was unknown but was thought to be probably due to a general change in lipid metabolism in preparation for lactation. There was no departure from this gradual increase in the toxemias. The cholesterol and lecithin content of the blood are also gradually increased during the latter half of pregnancy. Tyler and Underhill¹⁰ found an increase in the fat content as early as the third month. From a study of this case it is evident that some local circulatory disturbance has unmasked this intravascular fat in the kidney, and we feel that it is the result rather than the causal factor in this necrosis. If a vasoparesis with stasis be the etiologic factor for this necrosis, some vascular irritant must be searched for which has a special affinity for renal cortical vessels.

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DELAYED CHLOROFORM POISONING

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IN 1924 we reported a chemical study of a case of delayed chloroform poisoning,¹ in which the outstanding features were an increased destruction of protein, a lowering of the alkali reserve of the body, a disturbance of liver function, and a moderate degree of renal insufficiency. Since that time, we have studied experimentally the immediate effect of chloroform on the liver tissue as well as on the blood and urine constituents,² when we found that in the dog it produced pronounced central necrosis of the liver lobule and less marked kidney changes as soon as twenty minutes after its administration. Immediately following the administration of chloroform, the blood analyses revealed a hyperglycemia, whereas in delayed chloroform poisoning hypoglycemia is the usual finding. In our 1926 article,² we discussed the various factors that may play a rôle in the production of the hyperglycemia and the other abnormal chemical findings immediately following chloroform anesthesia; consequently this paper is concerned only with delayed chloroform poisoning and is based upon a fatal case recently occurring on our service.

The clinical history of our patient is as follows: Unit History No. 36,217. A twenty-seven-year-old colored primigravida, who had her last menstrual period June 15, 1930, was admitted March 22, 1931, with a history of beginning labor. The family and personal history was negative, as likewise the Wassermann. Examination showed a well nourished individual. Heart and lungs normal. Blood pressure 120/75; urine negative for albumin. A normal sized child lay in L.O.T., head engaged. Fetal heart in left lower quadrant, rate 120. Cervix just admitted finger tip. Occasional labor pains.

Labor progressed very slowly, with infrequent and weak pains. Castor oil and quinine were given on the morning of March 23, 1931. At 6:00 P. M., March 23, 1931, the cervix was 3 cm. dilated and became fully dilated at 7:30 P. M. the following day. On account of poor cooperation the head was delivered by Ritgen maneuver at 8:18 P. M., March 24, 1931, when a second degree tear was sustained. The child was slightly asphyxiated but cried within a few minutes, weighed 3170 gm., and presented a biparietal of 10 cm. The placenta separated spontaneously and was expressed at 8:28 P. M., March 24, 1931, by Duncan method. Placenta and membranes intact. Blood loss 100 c.c. Both patients returned to ward in good condition.

Whiffs of chloroform were administered during the second stage, but full anesthesia was employed for one-half hour during the repair of the perineal tear. Chloroform was used instead of gas oxygen, owing to the fact that the regular delivery room anesthetist was not available at the time, and the amount used measured 2½ ounces.

On the third day after labor, the patient became increasingly drowsy and failed to rally, dying in a convulsion on the next day.

A single catheterized specimen at 10:15 A. M., March 28, 1931: volume 75 c.c.,

total nitrogen 0.487 gm., urea nitrogen 0.147 gm.—30.2 per cent of total nitrogen, ammonia nitrogen 0.121 gm.—24.8 per cent of total nitrogen.

At noon, March 28, 1931: volume 250 c.c., total nitrogen 0.515 gm., urea nitrogen 0.161 gm.—31 per cent of total nitrogen, ammonia nitrogen 0.180 gm.—34.9 per cent of total nitrogen.

Blood taken at 5:30 p. m., March 27, 1931, showed nonprotein nitrogen 88.2 mg. per 100 c.c. blood, uric acid 11.7, sugar 88, CO₂ combining power 24.2 volumes per cent, chlorides 435 mg. per 100 c.c. blood.

Blood taken at 11:00 A. M., March 28, 1931, nonprotein nitrogen 134.1 mg. per 100 c.c. blood, urea nitrogen 66.7, uric acid 12.6, sugar 182, CO₂ combining power 17.8 volumes per cent, chlorides 415 mg. per 100 c.c. blood, creatinine 4.6, amino acids 15.5, O₂ content (venous) 14.1 volumes per cent, O₂ capacity 17.5.

Comparing these findings with those we reported in 1924, it is found that both patients showed an increased excretion of nitrogen in the urine, with a marked increase in ammonia nitrogen and a decreased urea nitrogen. The two patients also presented almost identical blood constituent

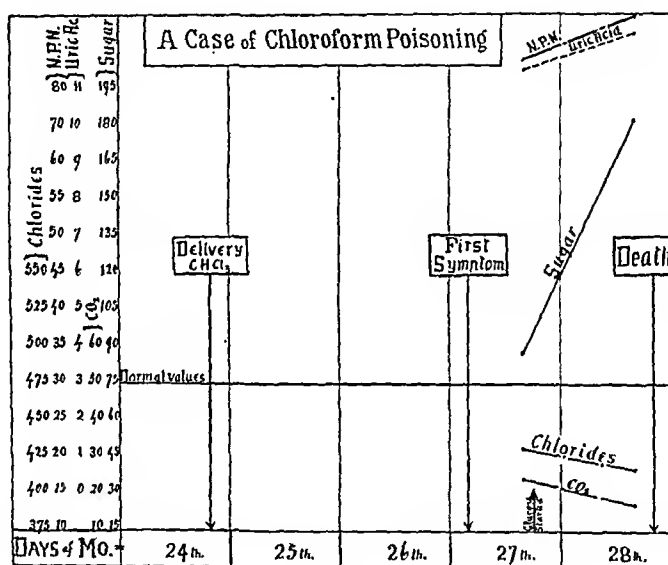


Fig. 1.

concentrations. The figures in the present case are so striking that we have plotted a few of them in Fig. 1.

Autopsy revealed typical central necrosis of the liver; the kidneys were normal; and so were all the other organs. Including the present one, five cases of delayed chloroform poisoning have occurred in this service since 1894. In two of them we have had an opportunity to carry out fairly complete chemical studies on the urine and blood. From the evidence thus far available, we may state that the outstanding characteristics of delayed chloroform poisoning are as follows:

1. As little as two ounces of chloroform, administered to induce surgical anesthesia, is sufficient to produce delayed poisoning.
2. The first symptom or indication of delayed poisoning usually appears two to three days following the use of the drug.
3. Vomiting or jaundice may or may not be present.
4. Drowsiness, stupor and coma always develop.

5. Autopsy findings always reveal central necrosis of the liver.
6. Kidney function may or may not be greatly impaired.
7. Urinalysis always shows increased nitrogen excretion, with high ammonia coefficient and low urea nitrogen.
8. Blood studies show an increasing nitrogen retention, low chloride concentration, marked uric acid increase, decreased alkali reserve to a level of true acidosis, a high concentration of amino acids, and a sugar level at or slightly below normal.
9. The mortality of this condition was 80 per cent in our five cases.

COMMENT

We have previously¹ discussed the theory relating to the "fixing" of chloroform by all or certain of the lipoids. Marked susceptibility to liver injury from chloroform has been noted in animals on a diet rich in fats.² Following their brain-feeding experiments, Davis and Whipple⁴ believe that their results in starvation disprove Opie's theory of chloroform "fixing" by fats.

Liver injury accompanied by a suddenly developing acidosis appears to be the most striking characteristic of delayed chloroform poisoning. The treatment in our last two cases, both of whom died, appears to be open to criticism in that the acidosis was not adequately treated. In the present case, we administered sodium bicarbonate by rectum, but the alkali was not retained. Active intravenous alkali therapy should have been instituted immediately after it became known that the CO_2 combining power had dropped to below 20 volumes per cent. The liver injury is best treated by the continuous intravenous administration of glucose. This was done in the present case, and its effect is shown by the blood sugar rising from 88 to 182 mg. per 100 c.c. blood. In general, it may be said that after delayed chloroform poisoning has developed our only hope lies in glucose therapy and antiacidosis measures.

We are reporting this case, however, particularly for the purpose of stressing the danger of using chloroform in any surgical procedure. Whiffs of it, with an abundant supply of air, may be permissible when the child's head is passing over the perineum, provided no other anesthetic is available. On the other hand, the use of chloroform during perineal repair seems absolutely contraindicated, as here deep anesthesia is necessary. We realize that chloroform is sometimes used in surgical procedures, but great experience and good anesthesia technic are essential. As most of us are not schooled in the proper administration of this agent, it would be better never to use it in any surgical procedure, however simple. Finally, we feel that many deaths occurring two to four days following the use of chloroform, are really due to delayed poisoning, but the relation is not recognized so that death is attributed to some other cause.

CONCLUSIONS

1. The mortality in delayed chloroform poisoning is about 80 per cent.
2. Intravenous glucose therapy and antiaacidosis measures, such as sodium bicarbonate intravenously, offer the only hope of recovery.
3. Chloroform should not be used in any surgical procedure, except by an expert anesthetist especially schooled in its use.
4. The only place for chloroform in obstetrics is late in the second stage, when it should be administered in whiffs (anesthesia a la reine); and even then it should only be used when no other anesthetic is available or indicated.

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LEUCOPLAKIA OF THE UTERINE CERVIX

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LEUCOPLAKIA of the cervix is a rare condition, only ten cases being reported in the literature up to 1927. It manifests itself with no typical symptomatology and occurs mostly after the third decade of life. The etiology is unknown, though various forms of mechanical, bacteriologic and chemical irritations probably are involved.

As elsewhere, leucoplakia of the cervix must be considered precancerous and the length of time required for a cervical leucoplakia to develop malignant changes ranges from two years (von Franqué) to eight years (Verdalle¹).

The characteristic histopathology of cervical leucoplakia is brought out in the illustrations. When malignant changes occur within a leucoplakia, these are similar to those observed in like growths on mucous surfaces elsewhere. However, when stratified squamous epithelium is desquamated in the formation of an erosion on the cervix, during the stage of healing, the regenerating epithelium may grown down into the lumina of the glands so denuded, without thereby developing a malignant character (Fig. 5).

In diagnosing cervical leucoplakia, reliance must be placed, not upon the symptomatology, which is slight, but upon cervical inspection in all cases presenting pelvic symptoms of any kind. Smaller lesions are best seen with an instrument devised by Hinselmaun called the colposcope. Following West's² suggestion for detecting cervical cancers, it is well to conduct periodic pelvic examinations of women of middle age in order to discover cervical leucoplakias. If the lesion be small, complete excision as recommended by Bloodgood³ for skin tumors, is the method of choice and pathologic examination of the tissue is car-

ried out at leisure. Following excision, radium is applied according to the technic described below. For larger lesions, again following Bloodgood's recommendations, excision of a piece of tissue with the cautery knife and immediate examination of a frozen section should be performed. Hinselmann and Esser⁴ have found that apparently complete removal of a leucoplakie spot may be followed by recurrence. No recurrence is likely if radium is properly applied.

In the treatment of cervical leucoplakia, cauterant chemicals have been found ineffectual. Amputation of the cervix is carried out routinely by Hinselmann⁵ according to the method of Bonney. As in one of my cases, the leucoplakia may extend through the cervical canal into the uterine cavity. When such is the case, amputation is inadequate. Moreover, whenever radium is available, in the absence within the leucoplakia of malignant changes, surgery is not necessary. Radium will, according to Sanford Withers, eliminate nonmalignant leucoplakia readily when properly applied.

The latter's technic, as given to me, is as follows:

Radium in sufficient quantity to cause destruction of the cervical mucous membrane is applied against the entire cervix. For this purpose the radium is enclosed within a 2 mm. thick lead cup or saucer and placed against the cervix. By this method 25 to 50 mg. hours per square centimeter of surface involved are applied. When the leucoplakia extends into the cervical canal or even into the uterus, a capsule of radium may be inserted into the former up to the internal os, and a dose of 250 to 400 mg. hours, with as little filter as possible is given. One application of radium is all that is usually necessary to clear up the leucoplakia.

When precancerous or early carcinomatous changes are present within the leucoplakia, radium is still the treatment of choice.

CASE REPORTS

The following cases were referred to me by Sanford Withers.

CASE 1.—Mrs. S. B., widow, aged sixty-nine. Until the present illness she had always been well. She had given birth to 6 children. Had always had normal menses until her menopause at fifty-two years of age.

Present complaint: For nine weeks she had flowed a moderate quantity of bright red blood.

Pelvic examination showed the cervix and almost the entire uterus protruding from the vaginal orifice. A collar of lusterless white mucous membrane covered the cervix, with an erosion of dark red color 6 mm. in diameter passing from the cervical canal outward. Tubes and ovaries seemed normal to palpation. Blood Wassermann was negative.

Vaginal hysterectomy was performed and sections were made from specimen removed (Figs. 1 to 5).

Pathologic examination disclosed a leucoplakia of the uterine cervix, no malignancy present. Erosion of the cervix. Patient has shown no malignant metastases after seven months.

CASE 2.—Mrs. S. S., housewife, aged forty-one. Had always been well. One child. No miscarriages. Menses regular but painful.

Present complaint: had leucorrhea and spotting of blood.

Examination showed a uterus and a cervix freely movable. The body of the uterus had a feeling of increased density. The cervix was enlarged and eroded at

two points, one of which was surrounded by an area white in color. There was a small nabothian cyst. Blood Wassermann negative.

Excision was performed on the entire leucoplakic area 6 by 4 mm. in size and paraffin sections made (Fig. 6). Following this radium was applied.

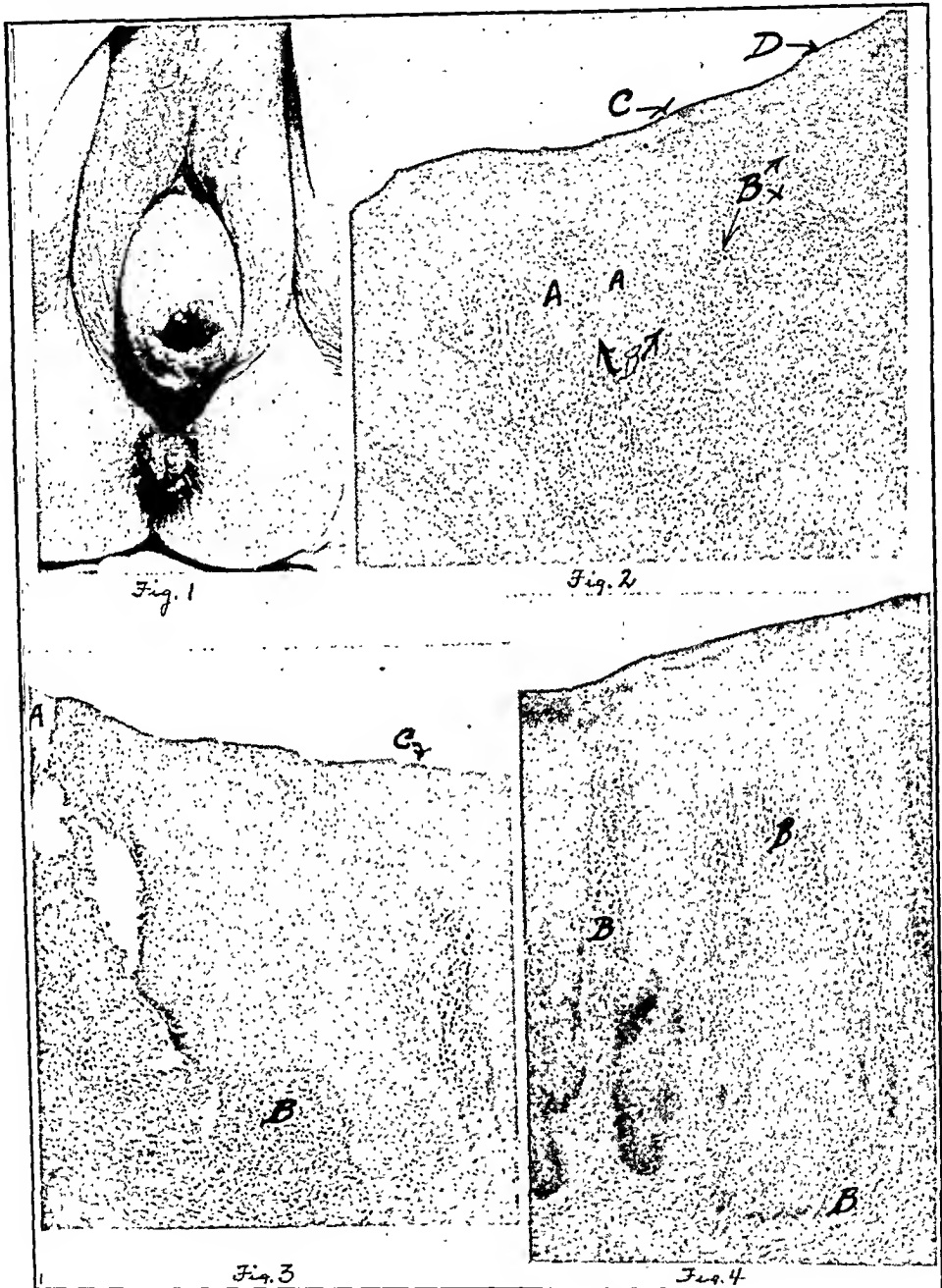


Fig. 1.—Prolapsed cervix and uterus, showing dark area of erosion and whitish collar of leucoplakia in the cervix. (Case 1.)

Fig. 2.—Leucoplakic area showing diffuse round cell infiltration (B) at the margin and beneath irregular rete Malpighii pegs (A). Latter are bizarre and atypical. Cornification present (C). Sudden transition to more normal epithelium at (D). (Case 1.)

Fig. 3.—A break in the epithelium due to ulceration (A); round cell infiltration beneath and between rete pegs (B). Stratified squamous epithelium greatly thickened, cornified epithelium covering the surface (C). (Case 1.)

Fig. 4.—Irregular and bizarre rete pegs which are atypical, having precancerous appearance. Round cell infiltration between and within rete pegs. (Case 1.)



Fig. 5.—Downgrowth of stratified squamous epithelium of leucoplakia into a gland at (B). Contrast this with the single layer of columnar epithelium at (A), in a similar gland. Atypical but not malignant. (Case 1.)

Fig. 6.—Leucoplakia showing thickened stratified epithelium (A); ulcerous excavation (B); diffuse round cell infiltration beneath epithelium. A number of detached epithelial cell nests (C) which constitute a very early change in a malignant direction underneath the leucoplakic epithelium. Cornification present (D). (Case 2.)

Examination showed a leucoplakia with early squamous cell carcinoma.

No recurrence of either process after eight months.

CASE 3.—Mrs. K. C., widow, sixty-five years of age.

Past History: Widow for eighteen years; married for fifteen years previously. Had two children, one well, the other with heart disease. Had been well all her life. Menses commenced at eleven years; always regular; no dysmenorrhea; duration three days; scant flow; menopause at forty years of age. No difficulty at that time. No operations at any time.

Present complaint: Bloody vaginal discharge for one month.

Onset and course: For one year patient has had urinary frequency at night, 7 or 8 voidings each night. Complained then of a thin whitish discharge from the vagina. Three months ago this became profuse, yellow and odorous. Two months ago there occurred a bloody discharge without clots. Since then she has been spotting blood.

Examination revealed a well-nourished woman; lungs, heart and abdomen were negative. Vaginal examination showed a second degree prolapse of the uterus, and the anterior lip of the cervix enlarged to about $2\frac{1}{2}$ by $1\frac{1}{2}$ inches and consisted of a cauliflower-like growth of tissue which bled easily when manipulated and was of whitish coloration. There was present bleeding from the cervical canal. The uterus and cervix were freely movable and the adnexa were not palpable.

Microscopic examination of the tissue of the cervix after hysterectomy showed a definite thickening of the stratified squamous epithelium of a leucoplakic character as in Case 1, and no premalignant changes were evident.

Pathologic diagnosis: Leucoplakia of the uterine cervix. No malignancy.

Patient well after eight months.

SUMMARY AND CONCLUSIONS

1. Large leucoplakias of the cervix are considered rare.
2. Simple leucoplakia is a benign condition, but cancer may eventually become engrafted upon it in a considerable number of cases. Hence it is well to treat it as a precancerous condition.

3. Leucoplakia of the cervix displays few symptoms, none of which are pathognomonic, direct examination of this organ alone leading to its detection. Consequently, periodic and routine examinations of women after thirty years of age are recommended.

4. Pathologic examination of leucoplakic tissue removed with proper technic in cases of cervical leucoplakia is urged to detect malignant changes.

5. The most effective and rapid treatment of nonmalignant leucoplakia of the cervix is the application of radium.

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REPUBLIC BUILDING.

THE MODIFICATION OF THE ASCHHEIM-ZONDEK TEST BY THE USE OF BLOOD SERUM. PRELIMINARY REPORT*

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WHILE the technic of the Aschheim-Zondek test is comparatively simple, there are two practical disadvantages, including the multiple injections of the mice extending over a period of three days, with subsequent examination at the end of one hundred hours, and likewise the toxicity of the urine with death of the mice in a high percentage of cases, even when the urine is detoxified with ether or sulphosalicylic acid.

In an attempt to overcome these disadvantages, a series of experiments were performed, using blood serum instead of urine for the mouse inoculation. Parallel tests on the urine of the same cases, using the Aschheim-Zondek technic were performed at the same time.

Technic.—Blood was collected from the vein in the usual manner. After coagulation, it was centrifuged and 1 c.c. of blood serum injected subcutaneously into each of two or three immature female mice, weighing 6 to 8 gm. The animals were killed after seventy-two hours and examined according to Finkel's method for hyperemia and enlargement of the uterus.

In the first series of cases the tests were made with serum from women six to eight months pregnant, specimens of blood and urine being obtained from patients in the Prenatal Clinic of the Bridgeport Hospital through the courtesy of Dr. H. E. Waterhouse.

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TABLE I

NO. CASES	AMT. OF SERUM	MICE			CONTROL	ASCHHEIM-ZONDEK URINE TEST	REMARKS
		A	B	C			
(1) 6 mo. gravid	1 c.c.	+	+	+	-	+	Large area of de-haired scar on abdomen of mice
(2) 6 mo. gravid	1 c.c.	+	-	+	-	+	Small B mouse below four grams
(3) 8 mo. gravid	1 c.c.	+	+	+	-	+	
(4) 8 mo. gravid	1 c.c.	+	+	+	-	+	Scab on abdomen
(5) 7 mo. gravid	1 c.c.	+	+	+	-	+	Scab on abdomen
(6) 7 mo. gravid	1 c.c.	+	+	+	-	+	
(7) 7 mo. gravid	1 c.c.	+	+	+	-	+	Scab on abdomen
(8) 7 mo. gravid	1 c.c.	+	+	+	-	+	

The mouse reaction after a single injection of serum was similar in all respects to that obtained from the urine of the same cases. The only exception was in Case 2, where one of the three mice was very small.

Similar results were obtained in ten cases of early pregnancy, ranging between five days to four months.

All 10 cases (Table II) showed a positive reaction with the serum; and in 7 cases on which it was done, the Aschheim-Zondek test on the urine was also positive.

In the above series serum and urine from sexually mature, healthy, young nonpregnant women were used. In these cases the specimens were taken between the end of the menstruation up to seven days before menstruation. Specimens were not collected later in the menstrual cycle in order to avoid any possible premenstrual reaction.

In all cases the tests, with both the urine and the serum were negative.

SUMMARY

1. A modification of the Aschheim-Zondek test for pregnancy is presented in which a single subcutaneous injection of 1 c.c. of blood serum into an undeveloped female mouse of 6 to 8 gm. is used.

2. A reaction, in all respects similar to the Aschheim-Zondek is obtained after an interval of seventy-two hours.

3. With the above method, there has been little mouse mortality.

4. It seems reasonable to assume that in pregnancy there is an increased amount of female sex hormone in the blood serum and that

TABLE II

NO. CASES	AMT. OF SERUM	MICE		CONTROL	ASCHHEIM-ZONDEK URINE TEST	REMARKS
		A	B			
(1) 12 wk. amenorrhea Mrs. B.	1 c.c.	+	+	-	Not done	
(2) 8 wk. amenorrhea Mrs. McC.	1 c.c.	+	+	-	Not done	Scab on abdomen of both mice
(3) 5 days amenorrhea Mrs. M.	1 c.c.	+	+	-	Positive	Scab on both mice
(4) 13 wk. amenorrhea Mrs. L.	1 c.c.	+	+	-	Not done	
(5) 12 wk. amenorrhea Mrs. M.	1 c.c.	+	+	-	Positive	
(6) 8 wk. amenorrhea Mrs. S.	1 c.c.	+	+	-	Positive	
(7) 3 wk. amenorrhea Mrs. L.	1 c.c.	+	+	-	Positive	
(8) 10 days amenorrhea Mrs. C.	1 c.c.	+	+	-	Positive	
(9) 8 wk. amenorrhea Mrs. R.	1 c.c.	+	+	-	Positive	
(10) 6 wk. amenorrhea Mrs. H.	1 c.c.	+	+	-	Positive	

TABLE III

NO. CASES	AMT. OF SERUM	MICE		CONTROL	ASCHHEIM-ZONDEK URINE TEST	REMARKS
		A	B			
(1) Miss McA.	1 c.c.	-	-	-	Negative	13 days, post menses
(2) Miss L. P.	1 c.c.	-	-	-	Negative	10 days, post menses
(3) Miss M. T.	1 c.c.	-	-	-	Negative	14 days, post menses
(4) Miss P. L.	1 c.c.	-	-	-	Negative	20 days, post menses
(5) Miss McM.	1 c.c.	-	-	-	Negative	20 days, post menses
(6) Miss C. L.	1 c.c.	-	-	-	Negative	10 days post menses

its increase in the urine is due to this fact rather than to any selective action of the kidney.

I wish to extend my earnest thanks to Dr. H. LeBaron Peters for the sincere cooperation I received in his Laboratory at the Bridgeport Hospital.

NOTE: Since this article was submitted for publication, tests have been carried out in seventy pregnant women at the Methodist Episcopal Hospital, ranging from the second to the eighth month. The reaction was positive in every case, with the loss of only six mice in a series of 140 used for the tests.

ATRESIA ANI VAGINALIS

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ATRESIA ani vaginalis or vaginal anus is a term broadly applied to a developmental defect in which the anus is absent from its usual location and the rectum terminates in the posterior wall of the vagina somewhere between the fornix and the fourchette. Vulval anus, vestibular anus, atresia ani hymenalis are synonymous terms limiting the rectal opening to a definite location.

Anorectal defects result from faulty embryologic development and the classification of these malformations varies but in all cases depends on the pathologic anatomy of the structures involved. Vaginal anus is segregated in that group of conditions in which the rectum terminates abnormally in some portion of the genitourinary tract. Brenner¹ states that this group of malformations makes up 40 per cent of all cases. As the rectum and genitourinary tract open into a common cloaca early in embryologic life, an arrest of the development of the tissues between the rectal and genitourinary portion of the cloaca will result in the rectum opening in some portion of that tract.

No reliable statistics are available of the incidence of anorectal defects in general or vaginal anus in particular, but scores of individual cases and a few fairly large series of cases of vaginal anus have been reported. These reports are in the majority of cases of infants and children, and as the mortality is high, relatively few occurrences are reported in adults. Thirty-five of a series of 51 cases reported by Buckmaster² occurred in children under ten years of age. In 15 cases of this type reported by Brenner, 14 were under ten years of age.

The occurrence of cases of vaginal anus in infants and children is of slight importance to the obstetrician, but pregnancy occurring in an individual afflicted with such a malformation may be the basis for the development of serious complications. Fecal contamination of the parturient canal is unavoidable and the patient suffers all the risks of developing a postpartum infection, as well as the late consequences of lacerations with loss of sphincter control.

Following the delivery of the patient whose case is here reported, a study of the similar cases recorded in the literature was undertaken with the view of determining the results obtained in their management. Only eight cases were found, which with the present one makes

a total of nine reported to date. It is possible that some have been overlooked as was true in the 53 cases of vaginal anus collected by Buckmaster,² who stated that they "comprised most of those on record." Dwight³ however in 1895, the following year, reported a new case and mentioned several others, none of which were recorded by Buckmaster.

Following is an abstract of the eight previously reported cases of vaginal anus, the first three being included in Buckmaster's report and the fourth in Dwight's.

CASE 1.—(M. Fournier¹) Woman in labor five days. Rectum had to be emptied through large opening in vagina before labor could be terminated. Results not given.

CASE 2.—(Cook²) Deformity discovered while patient was in labor. Results not given.

CASE 3.—Patient had three children. Malformation accidentally discovered during examination for suspected disease of the rectum. Neither she, her husband, nor the accoucheur had suspected any abnormality. The anus was imperforate.

CASE 4.—(Tuck) Mentioned by Dwight.³ Discovered during labor, rectum opening into vulva below the hymen. Spontaneous labor. Good sphincter control resulted.

CASE 5.—(Le Masson⁴) Rectal malformation discovered during labor. The rectum terminated in the fossa navicularis, separated from the vagina by thin membrane. Spontaneous labor with slight lacerations on either side of the anovaginal septum but no laceration through this membrane. Repair produced good results and patient and baby were discharged on the twentieth day postpartum.

CASE 6.—(Smiley⁵) Discovered during labor. The rectum opened in posterior vaginal wall two inches above vaginal orifice. Prolonged labor terminated by forceps, and laceration of tight perineum. A moderate postpartum infection developed which subsided by the thirteenth day. Result continued sphincter control.

CASE 7.—(Pasehal⁶) Discovered during labor. Rectum opened in posterior wall of vagina $2\frac{1}{2}$ inches from the introitus. Sphincter muscle well developed. Contracted pelvis, cesarean section chosen as method of delivery, being the first one recorded. Result stated as unsuccessful.

CASE 8.—(Hipsley⁷) The rectal malformation in this instance was used as an indication for performance of cesarean section with the object of preventing loss of sphincter control. Results good.

Following is a more detailed report of the case which occurred in the White Memorial Clinic.

CASE REPORT

Mrs. E. B. M. entered the hospital September 9, 1928, in active labor, pains having started two hours before admission. She was nineteen years old, a primigravida, and one week before estimated term. The fetus was in right occipitoposterior. The anus was found to be absent from its usual location and the rectum terminated in the posterior portion of the vagina at the fourchet. Only a thin mucous membrane separated the vaginal and rectal passages. No evidence of sphincter ani muscle found, but the patient had normal control over the bowel movements except after the use of cathartics.

Course of Labor: The second stage of labor was allowed to progress until rupture of the anovaginal septum was imminent. Performance of a lateral episiotomy on each side carrying the incision lateral to the rectal opening, allowed the head to descend and push the rectum toward the sacrum, the delivery being terminated

spontaneously. The child weighed 7 pounds 8 ounces (3420 gm.). Since the episiotomy incisions were not extended by laceration, the previous anatomic relationship was reestablished by the repair. The puerperium was attended with no morbidity and the sphincter action remained satisfactory.

The mother of the patient stated that the patient was unable to have any bowel movements following birth. The attending physician performed an operation for this condition after which the development of the child was uneventful.

I communicated with the physician, and he stated that an incision was made through an imperforate anus and the opening dilated systematically until normal bowel movements occurred.

The unusual termination of the rectum was not noted by the physician and evidently no attempt was made to establish the anus at the normal location. I have been unable to find a single instance of the occurrence of pregnancy in an individual who had been operated upon for an imperforate vaginal anus.

Operations of various types have been described for correction of such rectal defects with the object of establishing the anus at the usual location. Though these efforts are imperative in some instances to save life, yet in any case where the rectum terminates in the vagina and with normal control present, avoidance of operative procedures is suggested by the results of the cases above reported, as in no case was loss of sphincter control definitely stated and unsatisfactory results were stated only once in the case with contracted pelvis. Pregnancy occurring with such an anomaly presents perhaps the greatest chance the patient would undergo of developing complications, and the absence of such in the reported cases is significant.

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1913 MARENGO STREET

REPORT OF A CASE OF LITHOPEDION CARRIED FOR FORTY YEARS

BY LAWRENCE S. OTELL, M. D., WASHINGTON, D. C.

PATIENT E. V., aged seventy-five, white female, entered the hospital complaining of weakness and paralysis.

She had always been unusually well and had no serious illnesses or operations. Married for forty-five years. No children. Forty years ago thought that she was pregnant and had usual signs and symptoms. After several months she noticed a lump in her left side which gradually, over a period of months, appeared to move to the midline and finally disappear entirely. Menstruation reappeared and there was no alteration up to the time of the menopause, which was without undue incident.

The present illness began three or four years ago with generalized muscular weakness and inability to use legs. Gradual loss of vision in left eye and dimness of vision in right. There was no definite paralysis or loss of sphincter control, though there was some urgency.

On admission blood pressure was 250/120. Somewhat obese elderly white woman, weak but not acutely ill. Left pupil did not react to light or produce consensual reflex. Right reacts and produces consensual reflex. Left disc shows complete diffuse grayish pallor with only two small vessels emerging from center. Right shows diffuse grayish pallor, not as marked as on left, however. Septum deviated to right. Dental caries; pyorrhea and gingivitis. Bilateral facial weakness more marked on left. Heart slightly enlarged to left. Sounds totally irregular with numerous extrasystoles. Left systolic murmur over precordium, not transmitted. Peripheral vessels sclerotic. Abdomen extremely hard, nodular mass in midline just above pelvic brim, apparently within or connected with uterus, as disclosed by pelvic examination.

Patient ran a slowly progressive downhill course with development of decubitus ulcers and loss of weight. There developed an increased spasticity with contractures of legs and, to a less extent of both arms. No changes in neurologic findings. Survived one mild pneumonic attack but quickly grew worse and died.

Clinical Impression.—Arteriosclerosis general and cerebral with hypertension; arteriosclerotic nephritis; optic atrophy; muscular atrophy and weakness with hyperactive reflexes, due to cerebral lesion, probably the result of vascular sclerosis; calcified uterine fibromas.

Autopsy Findings (Anatomical Diagnosis).—Generalized arteriosclerosis, especially of cerebral vessels; atrophy of cerebral cortex; encephomalacia (corpus striatum); emphysema; lithopedion formation.

Upon opening the abdominal cavity a large firm calcified nodular mass presented itself in the midline just above the symphysis. At first glance the mass had the appearance of calcified fibroids. Upon further inspection however, fetal parts could be discerned. The uterus, tubes, and ovaries, together with the lithopedion, were removed and taken to the laboratory of Dr. J. Whitredge Williams, where further study was made. Dr. Williams kindly consented to describe the specimen.

DESCRIPTION OF LITHOPEDION

Radiographic Examination.—The head shows very little bone structure. It is covered by partially calcified folds which evidently represent remains of the fetal membranes. Dispersed throughout the surface of the specimen, there are several localized splotchy areas of calcification. The skeletal framework is quite well visualized and shows a rather marked kyphosis in the lower dorsal region. Two forked ribs are noted. The shafts of the long bones show localized areas of bone destruction and thickening of the cortex, to such an extent that in places it obliterates the medullary canals.

Macroscopic Examination.—The specimen consists of the pelvic viscera and the lithopedion. Upon dissecting off the bladder and lower part of the vagina, it is seen that the lithopedion lies to the left of and behind the uterus.

A frontal view shows that the uterus measures 7 cm. in length, and except for the presence of adhesions presents a normal appearance. The fundus presents the usual curvature and from the right cornu extend the senile right tube and ovary. The left cornu is elongated with its upper margin flattened out and in direct contact with the lithopedion, and from its outer end extends the left tube.

The lithopedion lies almost entirely to the left of the uterus with the compressed head lying below and the compressed body above the left cornu. The body is folded in such a way that the right knee rests upon and protrudes over the middle of the fundus, while the lower ends of both legs extend backwards and laterally beyond the right cornu. The head lies in close contact with the left margin of the uterus with its vertex below the level of the external os, so that in life, it must have depressed the vaginal fornix and Douglas' culdesac.

The posterior view of the specimen shows that the posterior wall of the uterus has been incised, that the entire organ is curved upon itself so that its left margin is concave and is closely applied to the right side of the fetal head. In this location, the posterior wall of the uterus and the tissues enclosing the lithopedion are continuous down to the level of the internal os, where the continuity ceases, and the head is separated from the uterine margin by a triangular space.

The left tube is 11 cm. in length and with the ovary, extends outward and downward over the head of the lithopedion to be attached to the posterior surface of the tissues covering the vertex, $1\frac{1}{2}$ cm. above its most dependent part. In its uterine portion, where it passes over a depression between the head and body of the lithopedion, the tube is flattened anteroposteriorly into a bandlike structure 2 or 3 mm. in thickness and 5 or 6 mm. in height. Laterally, it presents its usual tubular appearance and is 6 or 7 mm. in diameter. A definite fimbriated end is

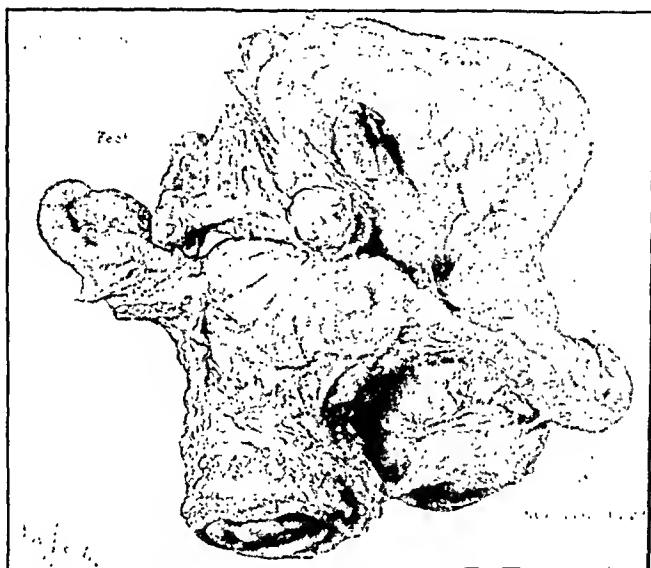


Fig. 1.—Front view of lithopedion, showing relation to uterus, and adnexa.

lacking, and the outermost extremity of the tube is firmly attached to the tissues covering the head over an area of 10 by 3 mm. The left ovary is elongated, shows no adhesions, and measures 4 by 1.5 by 1 cm.

The right tube measures 6 cm. in length and 5 mm. at its thickest part. The fimbriated end is occluded, and it seems probable that it was distended in vivo. The right ovary is covered by adhesions, is atrophic and measures 2 by 1.5 by 1 cm. Over the upper part of the lithopedion are many adhesions, one of which, over the knees and lower legs, is clearly omental in character.

Gross examination makes it probable that we have to deal with secondary development within the left broad ligament, although the condition of the left tube speaks against such a view.

Microscopic Examination.—Sections were made from various points, in hope of learning details of the mode of origin, and whether any trace of placenta could be demonstrated.

Study of the sections is unsatisfactory for, while it apparently indicates that the fetus lies within the folds of the left broad ligament, it gives no information concerning the point of origin of the pregnancy, and nowhere shows any sign of placental tissue.

1. Shows typical uterine muscularis with unusual development of the intramuscular connective tissue and hyaline degeneration of many vessels. The endometrium is not as atrophic as one would expect, and, in addition to areas of pronounced epithelial desquamation, it presents numerous rounded and oval spaces, up to 3 mm. in diameter, lined by well preserved cylindrical epithelium.

2. Sections through median end of right tube and ovary show that the tube wall has its usual muscular structure, but that all trace of the mucosa has disappeared. Notwithstanding this, the lumen remains as a well marked slit, whose wall is made up of muscular and connective tissue. While the ovary is devoid of follicles, it still presents a characteristic structure, with well marked stroma, occasional corpora fibrosa and many hyaline vessels. There are signs of previous periophoritis, and areas of germinal epithelium may be distinguished beneath well formed connective tissue. Near its upper pole, the ovary contains an irregularly

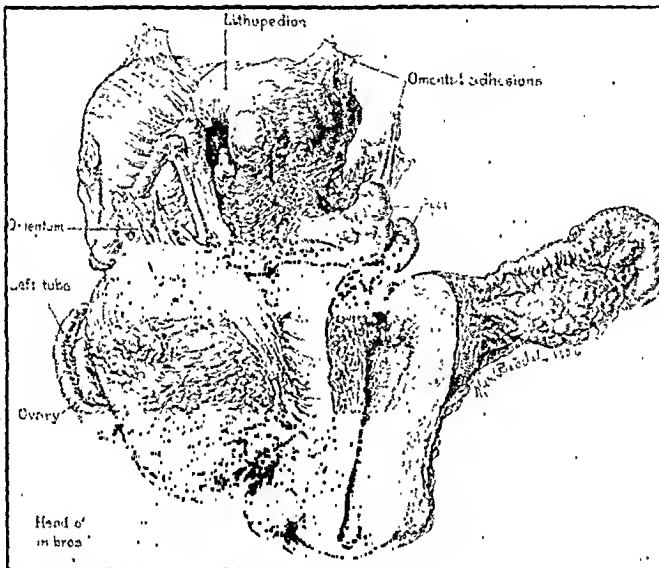


Fig. 2.—Back view of lithopedion.

rounded space, whose walls are irregular, and in places protrude into the lumen like a beginning papilloma. The cyst wall, as well as the projections, are covered by a single layer of cuboidal epithelium.

3. Sections through the median end of the left tube present the same structure as on the right side.

4. Except for its location, this section could not be taken for the ovary. It presents a capsule of muscular and connective tissue with many large vessels, while its interior is occupied by an oval mass 5 by 8 mm., which stains pink with eosin. Under the microscope, it consists of a structureless homogeneous tissue, which is almost devoid of cells, and the few which are present, are typical spindle-shaped connective tissue cells.

1835 EYE STREET, N. W.

AN UNUSUAL CASE OF ECTOPIC GESTATION

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MRS. M. U., aged twenty-nine, was seen in consultation with Dr. H. Schwarz, January 4, 1930. There was a history of a one-child sterility of nine years. Her husband was living and healthy. Of importance in her past history was a salpingitis, six years ago; no pregnancy since, no precautions used. She complained of recurrent lower abdominal pain and irregular bleeding. The last period was September 20, 1929, with onset of nausea in October, lasting two weeks. In November, the patient stained for four days and believed it a regular period, as she frequently missed one or two months. Early in December there occurred severe bilateral pelvic cramps and dull pains, associated with a heavy mucopuru-

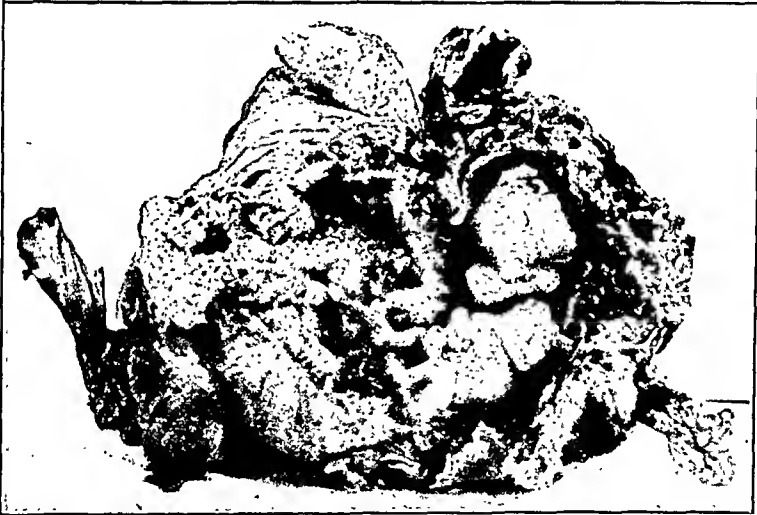


Fig. 1.—Left tube with fetus in situ, placental site bisected by incision.

lent leucorrhea. She was given a series of diathermy treatments, with some improvement. December 22, patient began to have crampy pains in left lower side, aching pains in legs, and passed a few clots. She bled heavily for two days, passed considerable detritus, and was believed to have miscarried. However, severe pains persisted, which were crampy and colicky in nature, and were felt over the entire lower abdomen, but were most marked in the left lower quadrant. There was considerable blood loss and progressive weakness. An ectopic pregnancy was considered and consultation requested.

The patient was in fair condition, apparently slightly anemic, markedly tender over the entire lower abdomen but slightly more so in the left hypogastric region. The uterus reached to within 2 fingers of the umbilicus. Vaginal examination revealed a vagina full of blood clots, a very soft, not tender, patulous cervix, and uterus enlarged to the size of a three months' or more pregnancy.

A semisolid mass, very tender and tense, about the size of an orange, occupied the left side of the pelvis, filling out the left fornix and giving marked pain on

bimanual pressure. The right adnexa could not be felt. It seemed inconceivable that a pregnancy would be retained from three to three and one-half months in the tube, especially after what seemed to be a miscarriage, in view of ergot and similar drugs administered. Also the size of the uterus was distinctly in favor of the diagnosis of incomplete abortion, complicated by ovarian cyst, with twisted pedicle, the latter presumably accounting for the miscarriage.

The patient was removed to the hospital. Spinal anesthesia was given and a curettage was performed. Large amounts of decidual tissue and what appeared to be the products of an incomplete abortion were removed from a uterus enlarged to that of a three months' size. A celiotomy was done and a large unruptured left ectopic pregnancy was found still bleeding through the fimbriated orifice of the intact tube. Large amounts of old and recent blood clots were found, with considerable free blood in the pelvis and abdomen. The fetus was about three months' size, the whole mass attaining the size of a large orange. It was removed in toto.

The right tube was found to be markedly thickened, enlarged and nodular, covered with old adhesions, and evidently the site of a former infection.

The unusual phases in this case are as follows:

1. The amount of external blood loss. It is decidedly unusual to have heavy vaginal bleeding with an ectopic pregnancy. The bleeding is scant, often a mere spotting, occasionally more. Few large clots are passed, and rarely is a decidual cast passed of sufficient size to resemble the aborted products of conception. In this instance not only was there a vaginal blood loss of dangerous degree, but passage of a large amount of formed detritus caused a diagnosis of miscarriage to be made.

2. The duration of the ectopic gestation. Usually only from four to eight weeks pass before tubal rupture takes place. Here, the pregnancy reached three and one-half months.

3. The uterine enlargement. The uterus always undergoes complementary enlargement in ectopic pregnancy, but rarely passes the size of a six weeks' pregnancy. Here the uterus was approximately the three and one-half months' size, it should have been were the pregnancy uterine.

4. The intraabdominal hemorrhage, which seemed quite extensive for fimbrial seepage with no actual tubal rupture. The size attained by the nonruptured tubal pregnancy, with the large chorionic surface facing the fimbriated end of the tube, accounts for it.

5. Pregnancy following a nine-year sterility, with gross and microscopic evidence of marked chronic tubal disease, again recalls the possibility of diseased tubes regaining patency.

39 GIFFORD AVENUE

REPORT OF CASE OF OVARIAN PREGNANCY

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MRS. L., aged thirty-four, married, housewife, has had four children, two alive and well, one stillbirth in 1923 and one died from peritonitis following a ruptured appendix.

In 1922 the patient had an appendectomy complicated with a pelvic peritonitis and made a good recovery in about three weeks.

Menstrual history was negative until present illness. The last regular menstrual period began November 23 with five days' duration which was her average time.

On December 7 she began to have a bloody vaginal discharge which required about one pad a day and complained of pain in lower portion of the back. Later in December about the time for her regular period the discharge increased in amount and was darker in color. About January 1 she began to have cramps across the lower abdomen which extended down into the rectum. The pain was not severe but would cause her to bend over and each attack would be about one hour in duration.



Fig. 1.—A, Cysts of the wall of the ovary, B, apparent corpus luteum tissue, C, piece of fimbriated end of tube, D, embryo.

She complained of weakness and soreness across the lower abdomen following each attack.

During one of these attacks a physician was called and after rest in bed for two weeks no more cramps occurred until about the last of January when the symptoms recurred. About this time, upon bimanual examination, there was a palpable mass in the right adnexa. On February 4, she had a severe attack of pain extending into the rectum. The pain was more severe than any previous attack and more vaginal bleeding occurred. The mass in the right adnexa had enlarged to about the size of a peach and was low and posterior to the uterus. It was well fixed and slightly tender. The white blood cell count was 6,000 and the urine was negative.

On February 5, she was operated upon; a preoperative diagnosis of ectopic pregnancy or cyst of right ovary, having been made.

Upon opening the abdomen a hemorrhagic mass was found to the right and posterior to the uterus. It was adherent to the rectum, and as it was released, blood clots were present between the rectum and the tumor mass. As adhesions from former pelvic peritonitis were released, the mass was found to be the right ovary. The ovary and tube was removed.

The patient made a normal recovery and was discharged from the hospital in fifteen days on February 20.

THE PATHOLOGIC FINDINGS

The ovary was dark red and somewhat pyramidal in shape. After being hardened in formalin it measured 7.5 by 6 by 5.5 cm. In the central region of the ovary was a cystic cavity 3 cm. across in which there was an embryo 2.3 cm. long. It was attached to the thinner portion of the ovarian wall, which was opposite to the point of attachment of the tube and ovarian ligament (Fig. 1). There was considerable hemorrhage and regions of softening in the wall.

The microscopic sections taken from several parts of the wall of the gestation sac showed the wall to be ovarian tissue. There were several small cysts in the wall. There was diffuse hemorrhage and many areas of degeneration. In the thick portion of the wall near the attachment of the ovarian ligament, there was what appeared to be coagulation necrosis of corpus luteum tissue, but this could not be definitely decided from many sections because of the degeneration. On the outer part of the wall near the ovarian ligament attachment was part of the fimbriated end of the tube. This tubal tissue did not extend through the wall to the fetal membranes. The chorionic villi are quite well preserved in most places. The tubal tissue was on the wall opposite the attachment of the embryo.

The embryo was definitely surrounded by ovarian tissue, yet there was some of the tube attached to the outer wall of the ovary. Impregnation might have occurred in the end of the tube but growth had taken place in the ovary, the location of the embryo was in the ovary.

In this case of ovarian pregnancy the embryo was quite well preserved. From the available literature, it appears that an embryo is found in about one-third of the cases of ovarian pregnancy.

HIGLEY BUILDING.

A REPORT OF A CASE OF HYDROPS UNIVERSALIS FETUS

By CHARLES A. GORDON, M.D., F.A.C.S., BROOKLYN, NEW YORK

THIS case of general dropsy or hydrops universalis fetus is reported because of its rarity and the importance of adding postmortem examinations to the literature.

Brilliantly reviewed for the first time by J. W. Ballantyne in 1892, no such comprehensive study has appeared since, although E. A. Schumann, in 1915, reporting a case, reviewed the literature. He concluded that it is due to a maternal toxemia impairing the circulation and the nutritive function of the placental cells, and thereby causing secondary circulatory and nutritional defects to ensue in the fetus. No direct evidence, however, was adduced in support of this theory.

Well described by Ballantyne as "a very rare condition characterized by general anasarca, fluid effusions in the peritoneum, pleural and pericardial sacs, and usually edema of the placenta, it usually results in death of the fetus before, during, or immediately after birth." It is to be distinguished from edema neonatorum, congenital elephantiasis, fetal syphilis, ascites, and fetal peritonitis.

L. S., Italian, seen by me with Dr. Chiaramonte, entered St. Catherine's Hospital, on January 15, 1931, in labor. She was twenty-nine years old, and had had

three children, all born spontaneously. The first is eight years old, the second died of jaundice one month after birth, and the third was stillborn at the eighth month, cause unknown. Her past history and also her husband's were negative for any familial disease or serious illness.

The duration of her pregnancy was thirty weeks. The antepartum period had been uneventful until the twentieth week when her abdomen began to grow rapidly in size with steadily increasing distress, and later pain and dyspnea. She felt life but little, with only occasional sluggish fetal movements.

When she went into premature labor, her abdomen was tense and markedly distended; the fetal heart sounds were even but distant, and fetal parts were not palpable. Pelvic measurements were normal. Her blood Wassermann, as well as her husband's, was negative. Labor progressed steadily. After eight hours, when the cervix was fully dilated, the membranes ruptured and a large amount of fluid escaped. The second stage lasted three hours, and was characterized by such violent, almost tonic uterine contractions, with the vertex at the spines, that uterine rupture seemed imminent. Delivery, however, was noninstrumental under light anesthesia and spontaneous to the shoulders. The fetal abdomen so distended the birth canal that strong traction was necessary. The fetus did not breathe, but heart action was visible for a few minutes. The placenta separated rapidly and was then easily expressed, notwithstanding its great size. The puerperium was afebrile and uneventful, and the patient was discharged in eleven days.

Pathologic Report.—Necropsy of newborn infant by Dr. E. H. Nidish. Female fetus measuring 43 cm., weighing 3980 gm. The skin was glossy, of a deep pink color, with deep markings at the flexures of the limbs. Surface edema was general except in the feet, which were very small. It was most marked in the buttocks and forehead, completely closing the eyes, and pitting 2 cm. deep could easily be obtained. There were no bodily deformities and no maceration.

The circumference of the abdomen was four and a half times the diameter of the head, the peritoneal cavity containing 1000 c.c. of clear straw-colored fluid. The liver was large, and under its left lobe posteriorly were found closely packed nonadherent coils of small intestine. There was very little meconium in the large intestine. The gall bladder was normal and contained some bile. The spleen was two and a half times its normal size, soft and quadrangular. The urachus and umbilical vessels were normal, as well as the pancreas, uterus, adnexa, and genito-urinary tract.

The entire thorax, with its viscera, was displaced upward. The lungs were small and unexpanded and both pleural cavities were filled with fluid. The heart was small, but normal, with patent ductus arteriosus, and the pericardial sac was also distended with fluid.

The bones of the skull were well ossified, but the skull was not opened.

Microscopic examination of kidney, liver, spleen, and pancreas revealed nothing but marked anemia.

The placenta weighed 2064 gm., measured $10\frac{1}{2}$ by 9 inches, and was over two inches in thickness. It was markedly edematous, friable, and pale. On section large quantities of fluid escaped. Histologically, it showed great edema with swollen and degenerated syncytial cells. Many villi were necrotic. The cord was almost three inches in circumference and also showed marked edema.

A PERINEAL RETRACTOR IN BREECH DELIVERIES*

ROBERT E. SEIBELS, M.D., F.A.C.S., COLUMBIA, S. C.

BREECH deliveries in primiparae, and often in elderly multiparae, remain one of the major problems in obstetrics. To most of us this presentation offers difficulties which occasionally are of extreme degree. Except in the hands of the most expert, there occurs extension of the arms, nuchal hitch, and extension of the head sufficiently often to arrest our enthusiasm and to give the obstetrician cause for serious thought when faced with this type of delivery.

After we have successfully overcome the above mentioned difficulties, there remains the protection of the maternal soft parts and the prevention of fetal asphyxia from inspiration of amniotic fluid and blood. It has been clearly demonstrated by Potter and his followers that the necessity for hurry, formerly taught, between the birth of the navel and the mouth does not exist, and it has also been clearly demonstrated that if we are extremely gentle in making traction on the baby's body, allowing it to be born largely by maternal effort, there will be no attempts at respiration on the part of the infant. Strong traction on the feet, extending the trunk, depresses the diaphragm and fluid is mechanically drawn into the baby's lungs. That one can be deliberate and obtain better results by not performing traction on the legs and trunk we have often demonstrated to our satisfaction and have frequently allowed twenty minutes to elapse between the birth of the navel and of the mouth. True as we know this to be, each minute that elapses from the time the umbilicus appears seems interminable, and we find the greatest difficulty in not hurrying the procedure from then on.

Especially do we feel the urge for speed when the shoulders have been successfully delivered and the hand, passing along the baby's throat finds the mouth free of the cervix, lying in the hollow of the sacrum. From this time on, it is nearly impossible to restrain one's energy and enthusiasm so that excess pressure is often made on the baby's head, shoulders are dragged on and even forceps have been devised rapidly to extract the head through the comparatively undilated vagina. One has only to review a series of such deliveries in his own practice to recall instances where he wrought serious damage either to the baby or to the maternal soft parts, or both, by hurrying this portion of the delivery. When the breech follows a version and the baby has had the maximum amount of stimulation to respiration from handling, the accoucheur is especially liable to feel a necessity for speedy delivery.

About five years ago, we began to consider the problem of fetal

*Read before the Eastern Carolina Medical Association, Myrtle Beach, South Carolina, July 23, 1931.

asphyxia after a series of disasters. If we could empty the upper respiratory passages of accumulated fluid and get air to the baby so that it could breathe when the mouth is free of the cervix, we would then be more content to let the delivery progress in a normal, slow manner, simply aiding maternal efforts in expulsion by moderate pressure on the fetal occiput. At first, we passed a catheter to the mouth and endeavored to empty the throat by suction and permit respiration, but with indifferent success. However, in attempting to pass the catheter on one occasion, it occurred to us to use a Sims retractor in order to depress the perineum and pass the catheter by sight rather than by touch. When the retractor was inserted and the perineum depressed, the baby's mouth was clearly exposed although it lay well above the ischial spines. Fluid was easily massaged from the throat and the baby began to breathe at once. The necessity for the catheter had been eliminated and since then we have used a perineal retractor as a routine procedure as soon as the chin passes the cervix.

The Sims retractor offers certain disadvantages which quickly became apparent and the malleable ribbon retractor was substituted for it. This retractor can be readily bent to any shape and length of blade desired and is more easily held by an assistant. As soon as the mouth is exposed by the retractor, the fluid is removed by sponges, the baby's body being held in slight extension at the neck. The throat is massaged gently and emptied and the baby begins to breathe. With the retractor in place, and the baby breathing, full protection can be offered to the maternal soft parts and the rapidity of the remainder of the delivery can be governed entirely by the mother's condition rather than by the fear of fetal asphyxia. The retractor is gradually withdrawn in front of the advancing brow and is removed as the mouth is born. Since its routine use, we have not had occasion to apply forceps to the after-coming head and there has been a decided lessening in damage to the musculature of the vaginal outlet. Occasionally faced with the necessity for performing a breech delivery without adequate assistance, the weighted vaginal speculum of the Edebohls type has been used, though not as efficiently as the ribbon retractor in the hands of an intelligent assistant. A search of the literature has not so far revealed previous recommendation of this method.

THE MEDICAL BUILDING

IMPROVED RECEIVING TABLE FOR THE NEWBORN

By HARRY STUCKERT, M.D., F.A.C.S., PHILADELPHIA, PA.

AFTER completion of the second stage of labor, not infrequently considerable time is required for the resuscitation of the baby, the ligation of the cord, and the institution of prophylactic treatment for ophthalmia neonatorum.

The temperature of the delivery room (80°) being much lower than the intra-uterine (100°) exposes the newborn to shock and pulmonary complications if kept in the low temperature for any length of time.

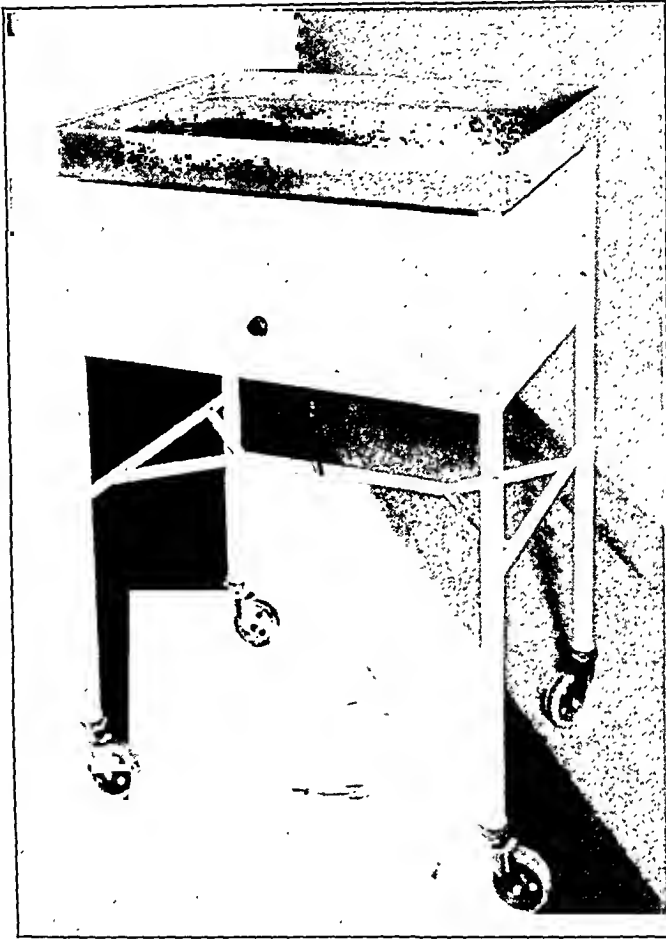


Fig. 1.

In order to maintain the body temperature and aid in the reduction of early complications occurring in the newborn from exposure to the sudden change in temperature, I have devised a method whereby the receiving table can be heated.

It consists of the small side table used in the operating room, the upper portion of which is inclosed. A series of electric light bulbs is placed within the inclosure.

The receiving surface of the table can be heated within five minutes and different degrees of temperature can be obtained by the attached three-way switch control.

This table is being used in the delivery rooms of the Jefferson Medical College Hospital.

248 SOUTH TWENTY-FIRST STREET

A REPORT OF A CASE OF CHORIONEPITHELIOMA FOLLOWED BY THE FRIEDMAN TEST

MAXWELL E. LAPHAM, M.D., PHILADELPHIA, PA.

*(From the Department of Gynecology of the Hospital of the University of
Pennsylvania)*

MRS. E. P., para iii, all spontaneous deliveries; last pregnancy in 1928. Last menstrual period November 16, 1930. On February 27, 1931, the patient reported to the dispensary with the complaint of spotting during the previous week. At that time, she had no other symptoms except anorexia and general weakness. After continuing to bleed for another week, she was admitted to the hospital. On March 7, 1931, a pelvic examination showed a soft cervix, moderate sanguineous discharge, a fundus the size of a three months' pregnancy. After rest in bed for five days, the bleeding ceased and the pelvic findings remained the same in other respects. The patient at that time gave a positive Friedman reaction. She was told to report to the hospital frequently for observation and to report immediately if there were any more bleeding.

On March 14, she returned bleeding moderately; this did not cease after the patient had been kept in bed for several days. The uterus had not increased in size and was slightly smaller than it should have been according to her menstrual history. It was concluded that the patient had an inevitable abortion, perhaps a missed abortion because of the apparent failure of the uterus to enlarge. She had a moderate anemia, hemaglobin 60 per cent, and it was decided to evacuate the uterus. A pregnancy test was not done at this time.

On March 17, the uterus was evacuated. No fetal parts were found but a great quantity of "decidual" tissue was removed. Several pieces of this tissue were rather typical of the "grape-like" formation of a hydatidiform mole. The pathologic examination verified the operative diagnosis. The patient made an uneventful recovery and at the end of ten days was discharged, having no bleeding, and with a uterus fairly well involuted, in a posterior position but freely movable and easily replaced.

On April 24, about one month after her second discharge from the hospital, she returned with the report that she had bled two days previously. The fundus was found to be slightly larger than normal and freely movable, and she had a profuse leucorrhea. A Friedman test was done and found to be positive, so that a second intrauterine examination was made and the pathologic report of the curettings showed the presence of chorionepithelioma.

On May 12, a panhysterectomy and bilateral salpingo-oophorectomy were done. Upon examination of the uterus grossly, it showed rather a discrete mass elevated above the endometrium. It was about the size of an egg and was situated on the posterior surface of the uterine cavity. The external surface of the uterus was smooth and pink. Upon microscopic examination, the tumor had penetrated into the myometrium but not through it. The tubes and ovaries were negative. The patient made a very good ultimate recovery and left the hospital on May 31, 1931.

On June 29, the patient again returned complaining of general weakness, deafness in the left ear and precordial pain. A pelvic examination revealed slight tenderness but no more than the normal amount after such an operation as the patient had undergone. She was destitute and apparently had been getting very little to eat, so that her general weakness and other symptoms might have been

due to malnutrition. She was extremely underweight and her blood pressure very low. A Friedman test done at this time, one month after operation, proved to be negative.

On September 4, the Friedman test was repeated and again was negative. The patient, in the meantime, had been living under better conditions and had gained weight, appearing and feeling much improved. Her only complaint was of a rather constant backache. Four months after operation, the patient was in fairly good health, and one would assume that she had made a complete recovery.

There are about 42 cases of hydatidiform mole reported to have been diagnosed and followed by the Aschheim-Zondek test or the Friedman test. Nearly as many cases of chorionepithelioma have been followed in the same manner, and the progress noted, by one of the two tests.

Schultze in Germany reported a case of chorionepithelioma which gave a positive Aschheim-Zondek reaction after hysterectomy. Metastases were found in the lungs by x-ray. Under irradiation, the patient recovered and the Aschheim-Zondek test became negative.

Otto has reported a case of ruptured chorionepithelioma, and after hysterectomy metastatic lesions were found in the lungs. Until death, three weeks after operation, the Aschheim-Zondek test remained positive.

Gerritgen reports a case of hysterectomy for chorionepithelioma followed for ten weeks after operation by the Aschheim-Zondek test, which always was positive. At autopsy, it was revealed there were metastases in the lungs and liver.

I have only mentioned a few of the cases in the literature in an attempt to show the importance of a careful "follow-up" of this type of case. It would seem that the Aschheim-Zondek and Friedman tests are extremely valuable in the diagnosis and prognosis of cases of hydatidiform mole and chorionepithelioma.

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(For discussion, see page 911.)

Erratum

In the Dieckmann and Wegner article, in the May number, the legend for Fig. 4, page 662, should read: "Fig. 4. Kidney. Shows the convoluted tubules in a state of *albuminous degeneration*." instead of hyaline degeneration.

Society Transactions

NEW YORK OBSTETRICAL SOCIETY

MEETING OF OCTOBER 13, 1931

DR. N. B. SACKETT (by invitation) presented a paper entitled **Intra-peritoneal Hemorrhage of Ovarian Origin**. (For original article see page 849.)

DISCUSSION

DR. R. T. FRANK.—It is quite evident that there is no single cause for ovarian hemorrhage. I agree that probably exaggeration of physiologic congestion near the time of menstruation plus some trauma or other cause which varies and cannot be readily found in the individual case, must be the explanation. We may have spontaneous hemorrhages anywhere in the body at this time. The ovary is well protected and yet a case was reported of a young girl who jumped over a fence and in doing so apparently, as was shown at operation, tore the ovarian cortex, causing intraperitoneal hemorrhage which manifested itself shortly after. A careful study of each individual case is indicated.

DR. G. G. WARD.—I agree likewise that it is extremely difficult to find any one factor, when so many things may cause rupture. The physiologic conditions are such that bleeding from the ovary is easy. There is no doubt that trauma is a factor. The point, of course, of great interest is the differential diagnosis from ectopic gestation and other conditions.

DR. GEORGE GELLHORN read (by invitation) a paper entitled **Local Anesthesia in Gynecology and Obstetrics**, of which an abstract follows.

Although local anesthesia by means of infiltration is unquestionably the least dangerous of all methods of surgical analgesia, it has, among gynecologists, not yet attained the popularity which it enjoys in the field of general surgery. It is true that gynecologic laparotomies can be performed under local anesthesia with ease and dispatch only when the operative technic and the operating room personnel are, so to speak, attuned to it. As such favorable conditions do not prevail in a general hospital, the author has used local anesthesia in abdominal operations only in very exceptional cases. In vaginal operations, on the other hand, local anesthesia enters into the closest competition with other means of relieving pain and, in fact, becomes the method of choice. The operations concerned fall into two large groups, namely, first, those on the uterus (dilatation and curettage, cervical amputation, anterior hysterotomy, interposition, hysterectomy, morcellation of fibroids), and, second, those on the outer genitals (partial or total vulvectomy, anterior colporrhaphy, perineorrhaphy, repair of complete tears). In the first group analgesia is produced by infiltration of the parametria, in the second by infiltration of the field of operation. The details of the technic have been discussed by the author in two previous papers in *Surgery, Gynecology and Obstetrics* in 1927 and 1930.

The standard fluid for injection is a $\frac{1}{4}$ per cent novocaine in a normal saline solution with the addition of 3 drops of adrenalin to each ounce of the fluid. In

every case, the patient is brought to the operating room in a fairly deep "twilight sleep" so as to allay her apprehension and to render the unnatural lithotomy position on the operating table endurable. In the vast majority of instances, complete analgesia is accomplished within five minutes and maintained throughout the operation; very rarely is a whiff or two of ether or gas required in lengthy operation, chiefly to relieve the discomfort of the strained posture. The amount of fluid needed ranges, according to the nature of the operation, from 2 to 4 ounces. Since the low percentage of the novocaine leaves the solution practically isotonic, there is no danger of toxicity even when large amounts have been used. Neither has the infiltration in hundreds of cases and in more than ten years ever interfered with wound healing. On the other hand, it has rendered operating completely bloodless in most instances and made dissection easier where such was required.

There are only two possible dangers connected with this method which, however, may readily be prevented. The needle may enter a blood vessel. In this case, the novocaine solution would be injected directly into the circulation and this would cause alarming symptoms. Although this complication has proved to be of short duration in the very few instances reported in literature, it may be avoided by a tentative pull on the piston which would show the absence of blood in the syringe. The second possible danger may come from breakage of the needle. Steel needles rust easily, and if a break occurs it is near the hub. The simple precaution consists in not inserting the needle its entire length.

Compared with these few negligible complications, the advantages of local anesthesia are numerous and impressive. Undisturbed by bleeding and no longer forced to work at top speed, the tissues involved can be carefully dissected and approximated. Further, all vaginal operations are more readily borne by patients than abdominal ones. This advantage is even more apparent when we are dealing with unfavorable cases, so-called "poor surgical risks." In this category we must first place aged people. The oldest patient on whom the author performed a vaginal hysterectomy under local anesthesia with perfect success, was seventy-six years of age. The author has operated successfully upon a number of patients with active tuberculosis, diffuse bronchitis, emphysema, cardiorenal disease, diabetes, and exophthalmic goiter. Neither hypertension nor hypotension form contraindications, as systematic blood pressure readings during operations have revealed no effect of local anesthesia in either direction.

In the field of obstetrics local anesthesia is more widely used in cesarean section. As a matter of historical interest it should be noted that the first operation of this sort was performed by Webster in Chicago in 1909. The author prefers the low cervical section and, as a rule, uses local anesthesia only for incising the abdominal wall. The separation of the bladder, the incision into the lower uterine segment and extraction of the child are done under a short ethylene narcosis, but the repair of the uterus and closure of the abdominal incision require no general anesthesia. It is, however, freely admitted that many other operators perform this operation entirely under local anesthesia. In any case, the traditional haste in closing the uterus becomes unnecessary and the increased thoroughness of adaptation acts as a safeguard against future rupture.

Of other obstetric operations, curettage for incomplete abortion (which, however, often requires nothing more than "twilight"), and interruption of pregnancy by means of anterior hysterotomy may be mentioned. In a recent case of the last named kind the patient suffered from a severe uncompensated heart lesion but passed easily through the operation during which she had no loss of blood whatever.

The use of local anesthesia in normal deliveries seems to the author of great practical value. The patient receives a preliminary semianesthesia by means of

morphine and scopolamine, amytal, or the like, which lasts well into the second stage. When the head descends below the spines, the lower circumference of the vulva, the levators and the perineal body are well infiltrated. This is followed within a few minutes by a marked relaxation of the pelvic floor, and the head passes painlessly either spontaneously or with low forceps through the vulva. Local anesthesia at this stage almost invariably slows down uterine contractions, and for this reason an injection of pituitrin is desirable. It has, of course, no ill effect on the child and none on the course of the third stage. Episiotomies can be made and, later, repaired without loss of blood or sense of pain, and the same is true of any tears that may have occurred. There is about local anesthesia in normal deliveries a sense of security and a simplicity and ease which render the procedure applicable both to hospital and home obstetrics, and in the latter case obviate the need of an anesthetist. The advantages of local anesthesia are accentuated when we have to deal with complicating diseases which render the use of inhalation narcosis undesirable. In this connection the author refers to cases of diabetes, acute bronchopneumonia, tuberculosis, and heart disease in which he employed local anesthesia with satisfaction.

With all these points in its favor, local anesthesia however, has its limitations. It cannot well be used in patients so nervous and apprehensive that even the preliminary "twilight sleep" fails to allay their restlessness. There are other patients who have an idiosyncrasy against novocaine even in the small amount used, and others in whom, for unexplained reasons, analgesia cannot be accomplished. In gynecologic operations where extensive peritoneal adhesions are encountered, local infiltration cannot do away with the pull on the parietal peritoneum and the resulting pain. In such instances, general narcosis may have to be instituted for a short time or the entire length of the operation. At any rate, no claim should be made for local anesthesia being a cure-all, but the advantages and the safety of this method are so great that they deserve earnest consideration in the field of gynecologic and obstetric surgery.

DISCUSSION

DR. A. C. BECK.—I would like to ask if veronal may be given the night before and the morning of the operation, in addition to the morphine and scopolamine.

DR. I. C. RUBIN.—My experience with local analgesia in obstetrics began about eight years ago in a case of pulmonary tuberculosis, both apices being cavernous. Several months preceding her delivery she had a tuberculous involvement of the larynx. One of the measures used consisted not only in keeping her absolutely quiet, but absolutely silent. As cesarean section appeared ideally indicated, I resorted for the first time to the use of local analgesia. The patient made a perfectly uneventful recovery. In that case I used gas while closing the abdominal wound. Since then, I have had a number of occasions to use local anesthesia in cesarean section. Its greatest advantage, as Dr. Williamson mentioned, is the almost negligible loss of blood. The uterine wall is blanched, the contractile power of the uterus appears to be not only retained, but it is increased.

I have also had occasion to use local infiltration for dilatation and curettage successfully at the Mount Sinai Hospital. The only painful reaction is encountered in dilating the internal os. The curettage itself is painless. If one infiltrates the parametrium carefully and sufficiently, pain may be averted; the cervical os dilates easily and there is no pain.

In gynecology I have found it valuable in those instances where the use of a general anesthetic is contraindicated, and where an expert in paravertebral anesthesia is not available. Another advantage of local anesthesia is the facility it affords in separating planes of cleavage, making the operation very much simpler.

OBSTETRICAL SOCIETY OF PHILADELPHIA

MEETING OF OCTOBER 1, 1931

DR. MAXWELL LAPHAM reported **A Case of Chorionepithelioma Followed by the Friedman Test.** (For original article see page 906.)

DISCUSSION

DR. JACOB WALKER.—A few months ago I was called to see a patient who was supposed to be threatened with abortion, but finding the uterus entirely out of proportion to the supposed time of pregnancy, I suspected a hydatidiform mole. I emptied the uterus and it proved to be this condition. She began to bleed shortly after she got home, and I had a Friedman pregnancy test performed which proved positive.

About ten days later I had the test repeated, it proved strongly positive. With these findings, I became suspicious of the development of chorionepithelioma. I went one step further, and had the Groskin test for malignancy and it proved positive.

With all these positive findings, I advised the patient to be operated upon. I then lost track of the patient but found that she had gone to another doctor, and after a period of time the hormone tests became negative.

I wish to bring out the fact that if the Friedman tests are of any assistance in the diagnosis of chorionepithelioma, the urine used in the test would have to be one-fifth strength of the normal urine, because chorionepithelioma gives a marked reaction, practically five times the strength of the normal urine of pregnant women.

DR. LAPHAM (closing).—I am doubtful about the use of one-fifth strength urine in the Friedman test. I believe that in the Aschheim-Zondek test the titration is about in that proportion, and that the reaction is five times as strong in chorionepithelioma as in normal pregnancy. However, in talking to Dr. Friedman he said that according to tests he had been working on, the titration in the rabbit cannot be compared with that used in rats, and he still felt uncertain about this matter until further work had been done.

DR. CHARLES C. NORRIS AND DR. DOUGLAS P. MURPHY presented a paper entitled **Malignant Ovarian Neoplasms.** (For original article see page 833.)

DISCUSSION

DR. WILLIAM R. NICHOLSON.—This paper emphasizes the fact that every case of real ovarian disease should be operated upon. The import of an ovarian tumor is much more threatening than fibroids for instance, and demands much more prompt operative treatment than does the latter condition. Another thing to be emphasized is that every case in which definite disease suggesting malignancy is found in one ovary at operation that the other ovary should always be removed.

With regard to Dr. Norris' statistics I feel that the mortality should be corrected, for there is no reason to include as malignant deaths, those women who died so soon after operation that the shock of the operation itself was probably the cause.

With regard to the x-ray, either before or after operation, I am still uncertain. My present belief is that it should be used in the vast majority of cases operated upon, while I am not convinced as yet as to its actual value.

DR. CHARLES A. BEHNEY.—Regarding the use of x-ray therapy in the treatment of ovarian malignancy, distinction must be made between the x-ray therapy practiced eight or ten years ago, and the high voltage treatment of the present time.

I have seen a number of patients who have had recurrences treated by high voltage irradiation. While none of these recovered completely, it is not unusual to note regression of the growth over periods varying from three to eight or nine months. This would indicate that the therapy is of real value.

X-ray therapy has improved, not only in respect to the penetrability of the rays, but also with regard to the precision of their dosage and cross-fire. Results obtained with modern apparatus, efficiently operated are not to be compared with the former soft-ray therapy administered in "hit or miss" manner. Recurrences can be prevented by high voltage therapy given immediately after operation, better than destroyed after they have developed.

DR. BROOKE M. ANSPACH.—It has always seemed to me that cancer of the ovary was much more uniformly fatal than cancer of the uterus. Unfortunately we have no statistics relative to ovarian cancer compiled with the same care that is observed in the reports on the treatment of uterine cancer; therefore there is no accurate basis of comparison.

The high death rate probably depends to a considerable extent, I believe, upon the fact that most ovarian cancers are diagnosed late. In our experience the majority have a palpable tumor, so recognized by the patient before they seek medical advice. In carefully studying the history, it appears that abdominal pain has been present for a considerable time before the patient has noted the abdominal enlargement but the pain has been of such a moderate degree that it has been disregarded. It may be thought by the patient to be intestinal indigestion or it may be referred to the bladder (irritability and distress attending urination) or to the rectum (difficulty or pain with defecation).

Sometimes the first symptom of ovarian carcinoma is bleeding. At an early stage there may be no palpable uterine enlargement, the woman often being very fat. Under these circumstances, after a negative diagnostic curettage, it is a great temptation to apply radium to the inside of the uterus. We have had at least one case in which such an application had been made the real nature of the trouble not appearing until later. Accordingly it would appear wise, in cases of postmenopausal bleeding, where the uterus is not enlarged and the mucosa shows nothing malignant, to delay the use of radium until a sufficiently long period of observation has ruled out the probability of an ovarian cancer.

DRS. JOHN A. McGLINN and STEPHEN E. TRACY also discussed this paper.

DRS. FLOYD E. KEENE AND ROBERT A. KIMBROUGH presented a paper entitled **End-Results of Radium Therapy in Carcinoma of the Cervix.** (For original article see page 838.)

DISCUSSION

DR. BROOKE M. ANSPACH.—The paper of Drs. Keene and Kimbrough forms the basis of an interesting comparison between the results they have had at the University Hospital and the results that Drs. Scheffey and Thudium reported last year from the Jefferson Hospital. The percentage of salvages was about the same, 15 per cent.

We have used nearly the same technic. In the earlier part of our series the dose was 2400 mg. hours, whereas in some of the later cases we increased it up to 3000 to 3600 mg. hours. Our idea in the beginning was that the first dose should be the maximum one and that irradiation should not be repeated. This probably grew out of the fact that in the beginning of our use of radium the effect at the end of six weeks was so striking that one was tempted to repeat the treatment at once. Almost invariably the second irradiation changed a patient free of symptoms to one with

many of them. In other words the second irradiation seemed to undo the relief of symptoms accomplished by the first application. In the course of time, however, although the initial dose has been slightly increased, we have reirradiated, but only where there was a visible occurrence of the carcinoma, in a position where irradiation was possible without injury to the surrounding tissues.

It is interesting to note one patient who through some error was given 1200 mg. hours in the beginning and six months later 3000 mg. hours; she is still living and well after eight years.

We have not used high amputation with the cautery knife. In the early stages we carefully avoid curettage or even any disturbance of proliferating carcinomatous masses: in later years, however, we have removed most of the redundant part with a cautery knife, taking great care to avoid anything like curettage.

In regard to a larger dose, in our experience 3600 mg. hours seems to be the safe limit. Any dose higher than that must be used with great caution as fistulae may follow no matter how careful the radium is screened. We have had two cases with very far advanced carcinoma in which the use of a large dose of radium, 3600 to 4000 mg. hours, was fatal. In one, an unsuspected pyosalpinx was the cause of a peritonitis; in the other nothing was found at autopsy so that we concluded that she had died from a toxemia, the result of absorption from the irradiated cancer tissue.

In the group of cases that we reported, it is interesting to note that two of our five-year recoveries were of the squamous cell type or the type usually resistant to radiotherapy.

Although very few of the cases in our reported first series were treated with the x-ray subsequent to radium, at the present time we believe, that deep x-ray therapy should be used as a rule, and in very advanced cases, before irradiation with radium. In the individual case of cancer of the cervix a very thorough anatomical study of its growth will help us reach a wise decision as to the dose of radium, the screening, and the exact distribution of the radium in the affected areas.

DR. STEPHEN E. TRACY.—It was a surprise to note that in the 479 cases seen by Keene and Kimbrough, 58, or 12 per cent, of the cases were in Group 1. In most clinics, the truly early cases do not constitute more than 2 per cent of the cases. The high percentage of cases in Group 1 is probably one explanation of their low percentage of five year cures.

The results from any method of treatment of carcinoma in any part of the body, will not be improved to any extent until the public and the profession are educated to the importance of early recognition and the advantage derived from prompt and appropriate treatment. No method of therapy will ever cure a patient afflicted with carcinomas, who comes for treatment in the terminal stage. During the last year, the Group 1 cases of carcinoma of the cervix uteri treated with radium as reported from a few clinics, show 100 per cent of five-year cures.

The number of milligram hours of radium given at a treatment does not mean anything. It is a question of filtration. We are gradually working over to larger dosage with heavier filtration, and the radium treatments are followed by deep x-ray therapy.

DR. CHARLES A. BEHNEY.—Recently at the Philadelphia General Hospital, in order to evaluate the use of deep x-ray therapy, we studied cases that had died since the institution of the Radium Clinic, and found that the duration of life was longer in Stage 3 cases, who received high voltage x-rays in addition to radium. On the other hand, in 186 cases in Stage 4, the patients who received deep x-ray therapy alone lived three times as long as those who received radium alone.

DR. DANIEL LONGAKER.—There is one point in this discussion that ought to be added to make it complete, and that is the very great responsibility of the fam-

ily doctor and the obstetrician in the matter of early diagnosis of carcinoma. The importance of postnatal care cannot be too strongly emphasized and every one who has an obstetric clientele should strive to train himself to recognize all departures from the norm, not only abnormality to touch but abnormality to sight under correct illumination with proper speculum exposure. No parturient should be discharged until she is well locally and generally.

DR. KIMBROUGH (concluding).—This series of cases has not been analyzed from the standpoint of the age of the patients, in whom the best results were obtained. Such an analysis, however, was made by Dr. Norris and myself in 1926 in 263 cases, and we found that the best results were obtained between the ages of forty and fifty years.

DR. F. E. KEENE AND DR. F. L. PAYNE presented a paper entitled **The Investigation of Sterility**. (For original article see page 857.)

DISCUSSION

DR. CHARLES MAZER.—We must not minimize the importance of the Hühner test in the study of sterility. Hostility of the cervical secretions in women who show no evidence of cervical infection is, in my opinion, indicative of an endocrine factor which, when removed, usually results in a positive Hühner test.

Doctors Keene and Payne stressed the importance of the Frank and Goldberger test in the diagnosis of sterility in regularly menstruating women who present no pelvic pathology and whose mates are normal. Women who fail to show a normal premenstrual level of female sex hormone in the circulating blood almost invariably show a lack of nidatory changes when euredted a day or two before the expected onset of the flow. As the corpus luteum, through its dual secretion, is simultaneously responsible for the premenstrual high level of female sex hormone and the nidatory changes in the endometrium, the absence of one or both may be taken as evidence of faulty luteinization without disturbance in the menstrual rhythm.

We have three drugs at our disposal which are of some value in the treatment of menstrual disturbances and the associated sterility. The two conditions merge insensibly.

Thyroid extract has no specific action. It accelerates cellular activity in every organ, not excepting the endocrine system. A marked diminution of thyroid function may profoundly affect the sex glands, but the condition is comparatively rare.

The anterior pituitary sex hormone, upon which ovarian function depends, is now available for therapeutic use. Dosage of this hormone is still undetermined. The administration of 50 M.U., hypodermically every other day, has given me encouraging results.

The standardized female sex hormone has no stimulative action upon the ovaries. It does, however, produce growth and vascularity of the uterus and renders it more responsive to whatever ovarian function there may be present or to renewed ovarian function as a result of treatment directed to the pituitary and ovaries.

The best results are obtainable through the use of low-dosage irradiation of the pituitary and ovaries.

DR. JACOB HOFFMAN.—We have been using the Frank and Goldberger female sex hormone test and the anterior pituitary hormone tests for the determination of ovarian activity on Dr. Anspaeh's service at Jefferson Hospital, and find them of value in estimating ovarian function. There are cases, however, in which the female sex hormone test tends to be misleading, as, for example, in amenorrhea accompanying follicular atresia and in menstrual disturbances during the early menopause. In these cases, a polyfolliculin stadium is often present, a result, we believe, of the absence of corpus luteum formation. Lacking the inhibitory control of the corpus

luteum, there follows the successive formation of atretic follicles and retention cysts, with a resulting accumulation of follicular hormone. This condition usually leads to a hyperplasia of the endometrium, and the female sex hormone test, in such cases, not infrequently shows large amounts of this hormone in the blood, despite the fact that we are dealing with a hypo-ovarian state. This test has proved reliable where it has yielded a negative reaction. In the latter class of cases it may be taken as an index of follicular insufficiency.

Concerning the anterior pituitary hormone tests, a positive reaction may safely be considered as indicative of ovarian failure.

In our experience, the most important and reliable, as well as the most valuable aid in estimating ovarian activity is the histologic picture of the endometrium presented by the curettings taken just before the expected period. A premenstrual endometrium found at this time may be taken as a sign of intact ovarian function, and of the presence of the follicular and corpus luteum hormones in the proper proportion. An atrophic endometrium signifies follicular inactivity and a deficiency of the follicular hormone. A hyperplastic endometrium shows an excess of the follicular hormone and a deficiency of progesterin, the hormone from the corpus luteum.

Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Collective Review

A Critical Review of the Obstetric Literature of 1931

J. P. GREENHILL, M.D., CHICAGO, ILL.

(Concluded from May issue.)

LABOR

General.—In an elaborate series of experiments on dogs Rudolph and Ivy⁹⁵ studied the coordination of the uterus in labor and found that there is both an intrinsic and an extrinsic coordinating mechanism and one may subserve, in part at least, the function of the other. Ivy, Hartman and Koff⁹⁶ record for the first time the manner in which the wave of contraction passes over the parturient uterus simplex of the monkey. From a constantly quiescent area slightly ventral and cranial to the insertion of the tubes, elliptical, concentric waves of contraction pass medially in the midline and cranial border of the uterus progressing caudally then involving the lower uterine segment and finally the cervix. (These interesting experiments will undoubtedly shed a great deal of light on such obstetric problems as so-called uterine atony, irregular uterine contractions, tetanic contractions, lack of dilatability of the cervix, the effect of drugs on the uterine musculature in the pregnant and nonpregnant state and many more problems, because most likely the action of the monkey's uterus is similar to that of woman.)

The studies of Calkins, Litzenberg and Plass⁹⁷ on the length of labor lead them to believe that a more accurate observation of the resistance of the cervix and the pelvic floor as well as a more accurate determination of the effectiveness of the labor pains, will be necessary in order to analyze the causes for the extreme variations in the length of labor so commonly encountered. The authors make suggestions concerning the recording of information about the cervix before and during labor and of the uterine contractions. (There is no doubt at all that not enough attention is paid to the study of the cervix during the last few weeks of pregnancy and during labor, and to uterine contractions during labor unless the latter is unusually prolonged. These studies are very important because in this country at least there is much more dystocia from the soft parts, [the cervix and the perineum] than from bony pelvic contractions. The length, shape, and consistency of the cervix and the frequency, duration, and especially the intensity of the uterine contractions are the most important factors in the determination of the duration of labor.)

Greenhill⁹⁸ reports in detail the type of intrapartum care given the patients at the Chicago Lying-in Hospital and cites the results. Among 23,136 labor cases there were 57 maternal deaths (24.6 per 10,000) and

the important causes of death were pneumonia 14, toxemia 10, heart disease 9, abruptio placentae 6, embolism 5, peritonitis 4, septicemia 3, and rupture of the uterus 3. Toombs⁹⁹ discusses the management of the first and second stages of labor. (A large proportion of patients are sadly neglected during labor. Because women in the first stage are treated conservatively and properly so, many of them are actually neglected until the child is ready to be born. Patients in labor need much more than a narcotic. It is important that the patient take fluids and nourishment, that her bladder and bowels be properly emptied, that she secure enough rest, that her courage be maintained especially if labor is prolonged, that examinations be made from time to time to determine the progress of labor and that the surroundings be kept as clean as possible. Special precautions are, of course, necessary in the second and third stages of labor and for at least an hour after the placenta has been delivered. There is no doubt whatever that proper care during labor will save the lives of numberless women. Good prenatal care has prevented thousands of deaths during the last few decades and in spite of this fact, just as many women die today from childbirth as died thirty years ago. This seeming paradox is due to the fact that what we save during pregnancy, we lose during labor by lack of care and by the tremendous increase in the incidence of operative deliveries. The number of forceps deliveries, versions and extractions and cesarean sections should be curtailed precipitously, especially by those who are not skilled obstetricians.)

Quigley¹⁰⁰ believes that the dangers associated with pregnancy and labor in women over thirty years of age have been greatly exaggerated. Losell¹⁰¹ compared a series of primiparas forty or more years of age with series of primiparas between twenty and twenty-five years and between thirty and thirty-five years. He found that as the age increased, there was an increased incidence of forceps deliveries and an increase in fetal mortality. Nixon¹⁰² studied a group of primiparas between forty and forty-five years old and found a maternal death rate of 4 per cent, a fetal mortality of 17 per cent, a higher incidence of toxemia and longer labors than among young women. Vermelin and Vaisbueh¹⁰³ collected from the literature 20 cases where women over fifty years of age became pregnant. There were no cases of toxemia but 5 of the 20 women had an hydatidiform mole. (Most likely the risk of labor in elderly primiparas has been overemphasized. We must distinguish between the elderly woman who has been married many years before she could conceive and the woman who married late in life and became pregnant immediately afterward. The latter will in most cases have a labor similar to that in young women, but the former may have trouble. In general it may be said that toxemias occur more frequently in older women and relatively more of them have hydatidiform moles. It is entirely too radical to perform a cesarean section simply because a patient is over forty years of age. However, since greater value should be placed upon the life of a baby in such a woman we should be willing to perform this operation when there are present such additional factors as breech presentation, moderate pelvic contraction, toxemia, or other complications.)

Series of cases in which labor was induced by means of castor oil, quinine and pituitary extract are reported by Mathieu and Siehel,¹⁰⁴ Fournier,¹⁰⁵ and Dodds.¹⁰⁶ The first authors report success in 96.6 per cent of 320 cases whereas the last one obtained satisfactory results in

only 54 per cent of his 338 cases. Vignes^{106a} praises formalin as an oxytocic. The studies of Schübel¹⁰⁷ showed that weak concentrations of quinine stimulate the isolated rabbit uterus whereas strong concentrations paralyze it. Hence in obstetrics only small doses of quinine should be used. Sztchlo¹⁰⁸ believes that premature rupture of the bag of waters is dangerous for both mother and child whereas Guttmacher and Douglas¹⁰⁹ recommend artificial rupture of the membranes as a safe and efficient method of inducing labor. (The question of induction of labor requires clarification. There are, of course, numerous instances when induction is necessary but in a large number of cases, labor is induced for the convenience of the physician or the patient. If a reliable and safe procedure can be made available, no great harm will result, unless vaginal manipulation is included in the procedure. In this case there is always the risk of infection. There are a few instances where quinine was most likely responsible for fetal death but the number is very small. The reviewer has always maintained that there is no necessity to give large doses of quinine to induce labor and the experiments of Schübel are gratifying because they tend to support this contention. Pituitary extract alone for the induction of labor is not often successful. The most certain way of inducing labor is rupture of the bag of waters but this always carries with it the risk of infection and of prolapse of the cord. However, if an experienced obstetrician would carry out this procedure in cases where the fetal head is engaged, under strict aseptic precautions, he will obtain excellent results. This statement is contrary to the belief we formerly held that rupture of the membranes was serious for the mother because of danger of infection and injury to the cervix, and it endangered the baby's brain because of direct pressure of the latter against the cervix. I have resorted to rupture of the membranes in many primiparas and multiparas and thus far my results have been excellent.)

Thymophysin is again the subject of many papers. This drug is highly praised by Lork¹¹⁰ and Temesvary¹¹¹ but it is condemned by Nelson,¹¹² Bauer,¹¹³ Fiecht¹¹⁴ and Halley and Whiteley.¹¹⁵ (I¹¹⁶ recently made a comparison of thymophysin and 25 per cent U. S. P. pituitary extract in a series of cases and a few of my conclusions are as follows: Weak pituitary solution and thymophysin are seldom effective for the induction of labor. They should not be used in the second stage except on rare occasions. Both drugs when administered during the first stage shorten labor in some cases. If these substances are used during the first stage they should be given only for a definite indication such as uterine atony or some urgent reason for shortening labor and only small doses should be given, namely, 3 minims or less. The 25 per cent pituitary extract and thymophysin give almost the same clinical results. Occasionally both preparations even in small doses may do harm. Both have a tendency to increase the blood pressure, and to result in incomplete relaxation of the uterus between pains and both may produce irregularities in the fetal heart rate.)

Analgesia and Anesthesia.—De Lee¹¹⁷ takes up in detail the indispensable use of narcotics in obstetrics. Whitaker¹¹⁸ praises the rectal administration of avertin for the relief of labor pains whereas Lewis and Hamilton¹¹⁹ favor the intravenous and intramuscular use of sodium amytal. Hamblen and Hamblin¹²⁰ believe the oral administration of sodium amytal is just as satisfactory as the intravenous route. Stander¹²¹ recommends avertin as an anesthetic when general inhalation anesthesia

is contraindicated. Bode¹²² and also Brown, Moloy and Laird¹²³ are of the belief that pernocton is a harmless and efficient analgesic in labor. In a symposium on the relief of pain during labor held before the Massachusetts State Medical Society, papers were presented by McCann,¹²⁴ O'Connor,¹²⁵ Parkhurst,¹²⁶ and Shay.¹²⁷ Pieree¹²⁸ is enthusiastic about the use of direct infiltration anesthesia not only for cesarean section but also for episiotomies and low forceps operations. Aburel¹²⁹ and De Peretti¹³⁰ also favor regional anesthesia but Klaus¹³¹ recommends lumbar anesthesia for cesarean section. Cosgrove¹³² maintains that nupercaine is less desirable than novocaine for spinal anesthesia in obstetrics. (Analgesia and anesthesia are important subjects in obstetrics. In spite of propaganda every few years in both medical literature and lay magazines in favor of new preparations and methods of relieving the pains of labor, morphine and pantopon remain the two safest and most reliable drugs. Avertin has a narrow margin of safety, pernocton produces excitation and sodium amytal is still on trial. As for anesthesia it is gratifying to see the increased popularity of local anesthesia especially by direct infiltration for episiotomy, low forceps, and cesarean section. All inhalation anesthetics entail some risk, especially in the presence of toxemia; and these dangers may be avoided or diminished by means of local anesthesia. Direct infiltration is safer and just as effective as spinal anesthesia, hence, it is preferable. The technique of its use is extremely simple and should be familiar to all who operate.)

Operative Obstetrics.—Rueker^{133, 134} again emphasizes the value of adrenalin in the treatment of contraction ring of the uterus. (This is a very valuable suggestion.)

The records of large groups of breech presentations are analyzed by Westman,¹³⁵ Gibberd,¹³⁶ Dearnley,¹³⁷ Bourne,¹³⁸ Dunbar¹³⁹ and Tausig.¹⁴⁰ The last named author emphasizes a number of very important rules which should be observed. (A breech delivery is the best test of an obstetrician's ability, because it requires an exact knowledge of the mechanism of labor, judgment as to the time of interference, a great deal of patience, skill in the extraction and the use of forceps on an after-coming head, gentleness, and a cool head. Since breech deliveries have a rather high fetal mortality among multiparas as well as among primiparas it is advisable to perform an external version during the last few weeks of pregnancy whenever this can be accomplished without undue force and manipulation. The Trendelenburg position may aid in this maneuver.)

Dennen¹⁴¹ and Zweifel¹⁴² report new types of forceps and Harper^{142a} describes the application of forceps. (Most obstetricians become adept with one type of forceps, and they can accomplish with this one instrument nearly everything which is claimed for new instruments devised for special purposes.)

The treatment of occipitoposterior position is discussed by Dodek,¹⁴³ Bill,¹⁴⁴ and Taylor.¹⁴⁵ Bill delivers most patients who have this complication by means of internal podalic version and breech extraction or by a modified Scanzoni forceps delivery. (In cases of persistent occipitoposterior the reviewer resorts to manual rotation of the head rather than rotation with the forceps because he believes it is less likely to produce harm to both mother and child. In cases where the head is high it is far safer to perform version and extraction than to attempt a high forceps operation with its danger to the mother and serious

consequences for the child. However, these operations should be performed only by experienced obstetricians and not by neophytes.)

In an excellent, extensive discussion, Plass¹⁴⁶ shows the relationship of forceps delivery and cesarean section to maternal and infant mortality and morbidity. (In this article Plass clearly demonstrates the harm which has resulted from the greatly increased incidence of operative deliveries. He points out the causes and remedies of this deplorable state of affairs and for this reason every physician should be familiar with the contents of Plass' paper. It is most regrettable that general practitioners, with limited obstetric experience, who see the excellent results obtained by well-trained obstetricians in specially equipped maternity hospitals, try to do the same things in general hospitals, some of which are none too clean, and with disastrous results.)

As usual a large number of articles have appeared on cesarean section. The general indications for this operation are reviewed by Winter¹⁴⁷ and analyses of large groups of cases are reported by many authors. Tollas¹⁴⁸ reports 252 cases with a death rate of 6 per cent. Phaneuf,¹⁴⁹ 418 cases with a mortality of 5 per cent, Johnston and Smith,¹⁵⁰ 258 cases with 10.5 per cent fatalities, and Greenhill,¹⁵¹ 140 personal cases with no deaths.

The indications for, and the results of Porro operations are discussed by Phaneuf.¹⁵² The technic of cesarean section under local infiltration anesthesia is described by Williamson,¹⁵³ and Kreis¹⁵⁴ analyzes the deaths following low cervical cesarean sections. Hornung¹⁵⁵ found that of 111 women who were delivered by the cervical cesarean section and subsequently became pregnant 57 were delivered vaginally. Holterman¹⁵⁶ prefers the extraperitoneal to the transperitoneal cervical operation. Campbell and Miller¹⁵⁷ review the subject of post-mortem cesarean section. (The old controversy continues concerning the relative merits of the classic, the transperitoneal cervical and the extraperitoneal cervical operations. Likewise there is a division of opinion as to whether the transverse is better than the longitudinal incision in performing the low operation. The consensus of opinion and the results in large series indicate that the cervical operation is superior to the classic one, and most individuals prefer the transperitoneal to the extraperitoneal operation. Likewise the longitudinal incision is the popular one. Porro operations have a definite though limited field and represent the only type of abdominal operation to be performed in frankly infected cases. Local anesthesia greatly diminishes the risk of cesarean section. In spite of this and in spite of the excellent results reported by individual operators or clinics, there should be a marked decrease in the number of these operations, especially by general surgeons and practitioners, because in their hands the maternal death rate is about ten per cent.)

Uterine Hemorrhage.—Calkins, Litzenberg, and Plass¹⁵⁸ analyzed 5,600 cases with reference to the amount of blood lost in the third stage of labor and they recommend a definite technic for the management of the placental stage. Smith¹⁵⁹ outlines the Dickinson-Pomeroy method of third stage technic. (These authors properly recommend conservatism with the aid of pituitary extract and ergot. As soon as there is evidence of separation of the placenta, the latter should be expressed by squeezing the uterus, but first we should be certain the uterus is

contracted and in the midline. It is dangerous to massage the uterus before the placenta has separated. Since the third stage of labor is just as important as the first or second and often more so, the physician should not be impatient and attempt to cut it short.) Placintianu¹⁶⁰ discusses the treatment of late postpartum hemorrhages and a number of papers deal with placenta previa. Rueker's¹⁶¹ main reliance in the treatment of placenta previa is the number 5 Voorhes bag, usually placed extraovularly and followed by version and extraction. He had five maternal deaths in a series of 141 cases (3.5 per cent). Thiemke¹⁶² also treated his cases conservatively and among his 228 cases the mortality was 6.1 per cent. In Peckham's¹⁶³ series of 146 cases which were treated essentially by colpeurynters, the death rate was 8.6 per cent. Bill¹⁶⁴ on the other hand, is strongly in favor of cesarean section with the aid of blood transfusion. He had only 2 maternal deaths among 104 cases. Others who favor cesarean section for placenta previa are Palliez¹⁶⁵ and Siegel.¹⁶⁶ Rotthaus¹⁶⁷ discusses the relative merits of cervical and corporeal cesarean section for placenta previa, whereas Essen-Möller¹⁶⁸ recommends vaginal cesarean section. (The reviewer is of the opinion that most women with central or partial placenta previa should be delivered by cesarean section, provided the patient is in a clean hospital and the physician has had sufficient experience with this operation. The safest type of cesarean is the cervical one. There need be no more fear of encountering the placenta in this type of operation than in the classic one. If the patient is potentially or actually infected and especially if she has a number of living children, a Porro operation should be performed. A transfusion should be given to patients who have lost much blood and local anesthesia should be used to prevent further diminution of the patient's resistance. There is no necessity to make a vaginal or even a rectal examination in a patient's home in order to make a diagnosis. Either of these types of examination may lead to serious hemorrhage. Every pregnant woman who has a hemorrhage should be sent to a hospital preferably without an internal examination or vaginal pack. If a woman must be delivered at home the best procedure is rupture of the membranes, firm packing of the vagina with wet cotton pledgets, and a Braxton-Hicks version. Likewise, in a hospital, delivery through the vagina is the method of choice in cases of marginal placenta previa and in a few cases of central and partial previas. Here a colpenrynter is more advisable than a Braxton-Hicks version. If a patient is to be delivered from below, the physician should remain with the patient constantly until the baby and placenta are delivered.)

Davis and McGee¹⁶⁹ have written an elaborate paper on abruptio placentae. They report 164 cases from the Chicago Lying-In Hospital with a maternal mortality of 7.3 per cent and a fetal death rate of 59.7 per cent. In the grave cases chief reliance was placed upon cesarean section. Kornfeld¹⁷⁰ favors conservative therapy in cases of abruptio placentae. In 50 cases at the Jewish Hospital (Brooklyn) there were no maternal deaths. Polak¹⁷¹ also believes in conservatism and he gives in detail the etiology, symptomatology, prognosis, and treatment of this condition. (Abruptio placentae may be very mild and on the other hand it may be rapidly fatal. The mild cases can certainly be treated conservatively. Since they generally occur during labor, the latter can usually be terminated by a forceps delivery or

version and extraction. In serious cases morphine and a blood transfusion should be given, the bag of waters ruptured, the vagina firmly packed with wet cotton pledgets, and a few small doses of pituitary extract given. The pulse rate, blood pressure, hemoglobin, and red blood cell count should be controlled at frequent intervals. If labor seems to progress and the patient's general condition does not become worse, delivery from below should be awaited. If, however, bleeding continues and the patient's condition becomes aggravated, a cesarean section should be performed under local anesthesia without delay. If the uterus presents the picture of uteroplacental apoplexy, it should be removed.)

PUERPERIUM

General.—Galloway,¹⁷² Lash,¹⁷³ Hanna¹⁷⁴ and Greenhill¹⁷⁵ all discuss postpartum care. (There are numerous prenatal clinics throughout the country and the results of their work amply justify their continued maintenance. On the other hand, there are comparatively few postpartum clinics in spite of the fact that this care after pregnancy is most essential. For most physicians, postpartum care consists of a small amount of attention for ten or twelve days after delivery and then a so-called final examination at the end of six or eight weeks. Furthermore, this examination is usually a cursory one. All women should be examined at least three times during the first twelve months after a baby is born. The cervix should always be inspected as well as palpated. Pathologic conditions should be corrected. Patients who have had toxemia, pyelitis or other complications during pregnancy or the puerperium, require special care after delivery.)

One of the greatest contributions in recent years is J. W. Williams'^{176, 177} description of the disappearance of the placental site during the puerperium. Williams' study showed unequivocally that the placental site is not absorbed as was formerly believed, but is undermined by proliferation of endometrial tissue and eventually exfoliated. This process usually requires six or seven weeks. (Every physician should carefully read this valuable article which was the last paper written by one of the greatest obstetricians in the world.)

Sepsis.—The experimental and clinical results obtained by Green, Pindar, Davis, and Mellanby¹⁷⁸ indicate that an adequate supply of vitamin A must be given to pregnant women. These authors found that 1.1 per cent of their vitamin treated cases as compared with 4.7 per cent of their control cases developed morbidity. Logan¹⁷⁹ found that a deviation from the ideal type of vaginal flora during pregnancy seemed to have little or no effect upon the production of puerperal sepsis. Brindeau and Vourkievitch¹⁸⁰ found a relationship between streptococci in the mouth of pregnant women and fever during the puerperium. Hence, they suggest that the throats of pregnant women be disinfected near term and those in attendance wear masks. (I have repeatedly stressed the importance of the use of masks in delivery rooms. Not only should the physician who is to do the delivery wear a mask but also the nurses, the assistants, the anesthetist and all onlookers. The mask should cover not only the mouth but also the nose. The patient also should wear a mask in the delivery room until she is to be anesthetized. These precautions are doubly important during the seasons of the year when grippe is prevalent.)

Welton, Glass and Mazzola¹⁸¹ point out the flaws in our present method of determining morbidity and they recommend that we list as morbid every patient who gives evidence of any definite or prolonged pathologic condition with or without fever, directly resulting from childbirth. (The authors are correct in maintaining that our present standards of morbidity are fallacious. We need uniform criteria for determining morbidity especially for the purpose of comparison.) Vignes¹⁸² discusses the acute infections of the mammary gland during lactation and Granzow¹⁸³ recommends roentgen ray treatment for this condition. (To be effective the x-rays must be used before suppuration has set in. If pus is present one or more incisions must be made.)

Harmon¹⁸⁴ shows that during the years 1922 to 1927, with the possible exception of the rural white population in this country, the death rates from puerperal septicemia have not declined among the groups studied (urban white, rural white, urban colored, and rural colored), and furthermore, the rates for each division have remained remarkably constant. (Puerperal septicemia is responsible for about 40 per cent of all maternal deaths and in spite of improvements in obstetrics its incidence has remained practically constant not only in the United States but in foreign countries as well. The chief reason for this is the increased incidence of operative deliveries and a marked augmentation in the number of criminal abortions.)

For the treatment of puerperal sepsis, Litwak¹⁸⁵ recommends transfusion of the patient's own blood, Kriel¹⁸⁶ favors antistreptococcus serum, Finger¹⁸⁷ suggests the administration of cholesterol, Fauvet¹⁸⁸ uses intravenous continuous drip transfusion of glucose solutions and Sorrentino's¹⁸⁹ therapy consists of a veritable bombardment of manipulation. He begins by giving antistreptococcus serum, then injections of the patient's own milk or cow's milk, urotropin intravenously, intramuscular injection of the patient's own blood, hypodermies of quinine and finally fixation abscesses produced by the injection of turpentine. (We ought to pity Sorrentino's patients. As yet we have no specific for puerperal sepsis. With the exception of blood transfusions, all intravenous therapy including alcohol, electrargol, collargol, rivanol, anelin dyes, salvarsan, meurochrome, etc., has failed to give even encouraging results. Likewise antistreptococcus serum has failed in most instances. The only thing we can do is build up the patient's resistance by bedrest, abundant fluids, glucose, nourishing food, sunlight, fresh air, and small blood transfusions.)

THE NEWBORN

Physiology.—Notwithstanding reports in the literature, Toombs¹⁹⁰ is of the opinion that there is no relationship between the mother's gain in weight during pregnancy and the infant's birth weight. Schmidt¹⁹¹ reports the case of a baby which was delivered spontaneously 274 days after the beginning of its mother's last menses and which weighed 5,500 gm. and measured 59 cm. in length. The author points out that this child probably weighed 3,600 gm. six weeks before term and almost 3,000 gm. eight weeks before delivery. Hence, this is indirect proof that a child born 230 days after the mother's last menses may have all the signs of maturity. Eparvier¹⁹² maintains that the centers of ossification of a newborn cannot be used as criteria of the intrauterine age of a fetus or of its maturity. (Schmidt's case is im-

portant in medicolegal cases. The reviewer agrees with Toombs. Women should not be permitted to gain too much weight for their own sake and not because of the erroneous belief that they will give birth to large babies.)

Complications.—Lyon and Bemis¹⁹³ analyze 117 neonatal deaths which occurred among 6,000 deliveries (2 per cent). There were 58 premature babies in this series and only 55 of the 117 babies were delivered normally. Cerebral hemorrhage was found in 25 out of 67 autopsies (37.7 per cent). Tyson and Crawford¹⁹⁴ found that 32.1 per cent of the babies in their series which came to autopsy had cerebral hemorrhage. In the series of 11,236 deliveries studied by Pigeaud and Brochier,¹⁹⁵ the fetal death rate was 7.8 per cent. Obstetric trauma caused 29.1 per cent of the deaths and syphilis was responsible for 22.3 per cent more. (In this country syphilis causes relatively few fetal deaths among white women. Prematurity, cerebral hemorrhage, toxemia and congenital malformations are much more frequent causes. A large proportion of fetal deaths can be prevented by good prenatal care, proper supervision during labor, conservative deliveries and special preparations for premature babies.)

Lazar¹⁹⁶ reports 80 cases of ophthalmia neonatorum of which 36 were of gonorrheal origin. (The instillation of silver nitrate or other silver preparation is required by law, and we take it for granted that every child is given this prophylactic treatment. Yet Lazar reports 36 cases of gonorrheal ophthalmia. This matter is serious when we realize that as late as 1922 Waldeek reported that 25 per cent of the blindness in the United States was due to ophthalmia neonatorum.)

A few epidemics of impetigo contagiosa neonatorum are reported by Swendson and Lee¹⁹⁷ and their treatment is as follows: Each vesicle is opened with an applicator dipped in alcohol and the base is swabbed with 5 per cent solution of silver nitrate. Taylor's dusting powder is applied freely to the whole body. (In addition to this the whole body should be exposed to the air and sunlight or to a therapeutic lamp. Strict isolation of each case, especially the first one, is imperative.)

In a symposium on resuscitation of the newborn, papers were presented by Coryllos,¹⁹⁸ Flagg,¹⁹⁹ Henderson,²⁰⁰ Crothers,²⁰¹ Kosmak,²⁰² and Murphy, Wilson, and Bowman.²⁰³ (This symposium is well worth reading because in it are expressed the viewpoints of physiologists, surgeons, anesthetists, neurologists, and obstetricians. As might be expected, there is no unity of opinion. The important things in resuscitation of the newborn are warmth, clearing the respiratory passages of mucus and other material and insufflation of air or oxygen. Most babies can be resuscitated by means of a tracheal catheter. For those not familiar with this simple life-saving device, the Drinker or the Kreiselman-Kane-Swope apparatus will be of considerable help. Forceful measures are to be condemned.)

THE PLACENTA

Various methods of determining the intactness of placentas were studied by Luh,²⁰⁴ and he came to the conclusion that inspection was the most reliable. Eastman²⁰⁵ found that following antenatal arsphenamine therapy, arsenic is retained in the human placenta for as long as fifteen days after the last treatment. The storage of arsenic and especially its greater concentration in the fetal part may be an im-

portant factor in the beneficial action upon the fetus resulting from arsphenamine treatment. (There is no doubt about the effectiveness of intensive antisyphilitic treatment during pregnancy in decreasing the fetal mortality due to syphilis.)

Montgomery²⁰⁶ presents a biologic and histologic study of infarction of the placenta. He prefers the term "neerosis" to "infarction" because the process begins with small areas of tissue death rather than with obstruction of circulation. (Montgomery is correct in preferring the term neerosis, first because the lesion has its origin in degeneration of the syncytium of the chorionic villi and secondly because the term infarct suggests an embolus which of course is not to be found.)

MISCELLANEOUS

In February, 1931, the White House Conference on Child Health and Protection was held in Washington, D. C. Adair²⁰⁷ made his address as chairman of the Committee on Prenatal and Maternal Care, Findley²⁰⁸ spoke on "The Undergraduate Teaching of Obstetrics," Holmes²⁰⁹ presented his report on "Graduate Education of Physicians in Obstetrics," Kosmak²¹⁰ spoke on "Obstetric Training of Nurses and Attendants," McCord's²¹¹ subject was "The Education of Midwives," Polak²¹² discussed "Maternal and Early Infant Care" (the last paper of one of our greatest teachers of obstetrics), Ehrenfest²¹³ spoke on the "Factors and Causes of Fetal, Newly Born, and Maternal Morbidity and Mortality," and Arey²¹⁴ took up the subject of "The Basic Sciences and Their Relation to Maternal and Fetal Problems." (These papers, presented by the chairmen of the various committees represent the results of studies made by the leading authorities in this country. Not only should the above reports be read but also, if obtainable, a copy of the Supplement to The United States Daily, Section II, Vol. VI, No. 29, April 6, 1931. This supplement contains valuable information.)

Another paper²¹⁵ devoted to improvement in the teaching of obstetrics is that which contains the recommendations made by the Committee on Maternal Welfare of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons. Findley²¹⁶ shows that as compared with surgery, the teaching of clinical obstetrics is woefully lacking in the major portion of our medical schools. (This is very unfortunate because a young practitioner is likely to develop a far greater obstetric practice than a surgical one. He takes many more chances with a patient in labor before calling a consultant than he does with a patient who requires a major surgical operation.)

A number of papers are devoted to maternal mortality, among them being those by McCusker²¹⁷ for the state of Oregon, Burkhard²¹⁸ for Colorado, Frank and Kushner²¹⁹ for Bronx Hospital, Starr²²⁰ for the Louisville City Hospital, Knox²²¹ for Maryland and Bell²²² for England and Wales. (All authors are agreed that the maternal mortality in the United States is far too high, but we should not keep repeating the utterly fallacious statement that our mortality rate is higher than it is in nearly every civilized country in the world. Regardless of this we can and should considerably decrease our obstetric deaths by improving the education of medical students, increasing the facilities for postgraduate instruction in obstetrics, adding more maternity hospitals and securing better quarters for obstetric patients in general hospitals, educating physicians to develop an honest obstetric con-

science, secure proper prenatal care for more women, considerably decrease the number of operative deliveries and educate the laity to the dignity and importance of obstetrics as a specialty. Undoubtedly the recently created Board of Obstetrics and Gynecology will do a great deal toward eliminating unnecessary maternal and fetal deaths.)

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185 NORTH WABASH AVENUE.

American Board of Obstetrics and Gynecology

The following additional names of men limiting their practice to Obstetrics and/or Gynecology have been approved for certification by the American Board of Obstetrics and Gynecology.

Arizona, Tucson: H. H. Ring.
 Colorado, Denver: Cuthbert Powell.
 District of Columbia, Washington: J. J. Mundell, R. Y. Sullivan, E. W. Titus, Prentiss Willson.
 Illinois, Chicago: Harry Scred.
 Iowa, Cedar Rapids: W. E. Brown.
 Kansas, Wichita: R. A. West.
 Louisiana, New Orleans: W. E. Levy.
 Maryland, Baltimore: L. H. Douglas.
 Massachusetts, Boston: E. P. Ruggles, E. W. Smith.
 Minnesota, St. Paul: A. G. Schulze.
 Missouri, Springfield: J. D. James.
 New York: H. E. Ayres, New York City; Adolph Bonner, Brooklyn; C. R. Hyde, Brooklyn; Theodore Neustaed-

ter, New York City; Benjamin Rabbiner, New York City; R. N. Ritchie, Rochester.
 North Carolina, Kinston: T. L. Lee.
 Ohio: W. D. Fullerton, Cleveland; Andrews Rogers, Columbus.
 Oklahoma, Tulsa: P. N. Charbonnet.
 Pennsylvania: Leon Clemmer, Philadelphia; E. B. Craig, Philadelphia; J. E. James, Jr., Philadelphia; David Katz, Pittsburgh.
 Tennessee, Memphis: P. C. Schreier.
 Texas, San Antonio: W. W. Maxwell, B. H. Passmore.
 Vermont, Burlington: O. N. Eastman.
 Virginia, Richmond: B. H. Gray.
 Syria, Beirut: H. G. Dorman.

At the recent meeting and examination of the American Board of Obstetrics and Gynecology held in New Orleans, on May 10, 1932, fifteen applicants were accepted for certification. Three failed to receive the required grades.

PAUL TITUS, M.D., Secretary-Treasurer,
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Books Received

GROWTH IN THE FETAL PERIOD. By Richard E. Seammon, Professor of Anatomy, University of Minnesota, and Leroy A. Calkins, Professor of Obstetrics and Gynecology, University of Kansas. The University of Minnesota Press.

CLINICAL STUDY OF THE ABDOMINAL CAVITY AND PERITONEUM. By Dr. Edward Meakin Livingston, Associate Visiting Surgeon, Bellevue Hospital, New York, 1932.

EUGENESIA Y MATRIMONIO. Dr. Francisco Haro Garcia. Editor: Javier Morata, Madrid, 1932.

DIE KONSERVATIVE BEHANDLUNG ENTZUENDLICHER GENITALER-KRANKUNGEN DER FRAU. Von Dozent Dr. Gustav Doederlein, Universitaets-Frauenklinik der Charite in Berlin. Mit 7 Abbildungen. Verlag von Georg Thieme, Leipzig, 1932.

TEXTBOOK OF GYNAECOLOGY. By Sidney Forsdike, Surgeon to the Hospital for Women, Soho Square, etc. London, William Heinemann, 1932.

GYNAEKOLOGISCHE OPERATIONSLEHRE. Von Hofrat Professor Dr. Josef Halban in Wien. Urban und Schwarzenberg, Wien, 1932.

SURGICAL PATHOLOGY OF THE FEMALE GENERATIVE ORGANS. By Dr. Arthur E. Hertzler, Surgeon to the Agnes Hertzler Memorial Hospital, Halstead, Kansas, and Professor of Surgery, University of Kansas. 258 illustrations, J. B. Lippincott Company, Philadelphia, 1932.

FERTILITY AND STERILITY IN MARRIAGE. Their voluntary promotion and limitation. By Dr. H. van de Velde, formerly Director of Gynecologic Clinic in Harlem, Holland. New York, Covici, Friede, Medical Books, 1932.

CONTROL OF CONCEPTION. An illustrated medical manual. By Dr. Robert Latou Dickinson and Louise Stevens Bryant, The Williams & Wilkins Company, Baltimore, 1931.

THE PRACTICE OF CONTRACEPTION. An international symposium and survey. Edited by Margaret Sanger and Dr. Hannah M. Stone. The Williams and Wilkins Company, Baltimore, 1931.

HUMAN STERILIZATION. By J. H. Landman, Ph.D., J.D., J.S.D. College of the City of New York. The Macmillan Co., New York, 1932.

PRACTICAL MEDICINE SERIES. Obstetrics edited by Joseph B. DeLee. Gynecology edited by J. P. Greenhill. Series 1931. Year Book Publishers, Inc., Chicago, 1932.

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LA TUBERCULOSE GÉNITALE DE LA FEMME. Par Professeur Constantin Daniel, Faculté de Médecine de Bucarest. G. Doin & Cie. Paris, 1932.

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